



This fifth (5th) edition of *Indicators of Climate Change (ICC) in California* Report continues OEHHA's two-decade effort to track changes in the state's climate. The 5th edition presents 49 indicators spanning greenhouse gas emissions, atmospheric and ocean chemistry, snowpack, wildfire, extreme heat, ecosystems, and human health. Several indicators document changes that have reached new thresholds since the 2022 edition.

This edition continues to integrate Tribal knowledge. California Tribes have observed ecological changes across their ancestral lands over generations. Their knowledge provides a record of environmental conditions that extends beyond instrumental measurement and can reveal changes, relationships, and consequences that quantitative indicators alone do not capture. These perspectives appear throughout the Report and in dedicated Tribal Connections sections.

Broad interconnected themes emerge across the indicators. Climate change is altering the systems that store and deliver water, increasing the severity and scale of wildfire, intensifying extreme heat, reshaping terrestrial ecosystems, transforming coastal and ocean environments, and impacting our health and well-being. Warming affects whether precipitation falls as rain or snow, when runoff reaches rivers and reservoirs, how quickly vegetation dries, the conditions under which wildfires burn, and the ability of people to recover from heat overnight. Across land and ocean, species are responding to changes in temperature, habitat, and the timing of seasonal events. The resulting risks are greatest where exposure is high and the resources needed to prepare, adapt, or recover are limited.

Water System and Snowpack

California's water system developed around predictable mountain snowpack and spring runoff. Warming shifts more precipitation from snow to rain, snow melts earlier, and runoff reaches rivers and reservoirs sooner. This creates a growing mismatch between

when water is available and when agricultural, municipal, and ecological demand is greatest. Across the state's long-term snow courses, 78% show declining April 1 snow-water equivalent trends. Peak runoff occurs earlier in many watersheds, reducing the natural storage function once provided by mountain snowpack. Glaciers in the Trinity Alps disappeared entirely by 2023, marking the complete loss of a feature tracked by an indicator. In the Sierra Nevada, glaciers have lost an average of 75% of their area since 1903.

These changes are affecting ecosystems and communities. Rivers that support salmon are also warming, with the South Fork Salmon River warming at a rate of 1.76°F per decade contributing to declines in salmon populations and disrupting freshwater ecosystems. California's commercial salmon fishing recently reopened in summer 2026, after an unprecedented three-year sequence of closures in 2023 through 2025. Declines in salmon populations also impact Tribes throughout the Klamath and Sacramento watersheds, as salmon are integral to food systems and cultural practices. Water insecurity is also increasing. During the 2012–2016 drought, more than 2,000 domestic wells ran dry, with failures concentrated in low-income, rural, and Hispanic/Latino communities in the Central Valley and Sierra Nevada foothills. Because securing alternative water supplies or replacing or deepening a well can be costly, well failures may place a greater burden on communities with fewer financial resources.

Wildfire, Extreme Heat, and Health

California's largest wildfires have become larger and more frequent, with average annual acreage burned from 2020 through 2024 reaching 5.7 times the pre-2000 average. All but two of the largest wildfires in California's recorded history have occurred since 2000, including nine in 2020 and 2021. As fires have grown, wildfire smoke has expanded the reach of its health impacts far beyond the fire perimeter. Californians now experience approximately 66 wildfire smoke days per year, nearly twice the average before 2017. Wildfire smoke contains fine particulate matter and other hazardous compounds that can aggravate respiratory and cardiovascular disease and affect mental health.

Extreme heat has also become more frequent with minimum nighttime temperatures rising by about 3.9°F since 1895, faster than daytime temperatures statewide. Warmer nights reduce the body's ability to recover from daytime heat, increasing physiological strain during prolonged heat events.

In 2020, concurrent smoke and extreme heat affected 68% of California's land area, exposing an estimated 16.5 million people to at least one compound event. Smoke impairs respiratory and cardiovascular function, while extreme heat increases physiological strain. Outdoor workers, including farmworkers and firefighters, face occupational exposure with limited ability to reduce work intensity or avoid hazardous conditions. Higher rates are reported among Black Californians, women, adults aged 50 to 64, and young children.

Official death records may underestimate heat-related mortality because heat can worsen underlying health conditions without being identified as the primary cause of death.

Terrestrial Ecosystems and Wildlife

Warming, drought, and wildfire are altering California's forests, wildlife communities, and seasonal cycles. An estimated 243 million trees died in California's forest lands between 2010 and 2024, driven by higher temperatures and reduced water availability. Large tree densities have declined by approximately 50% in the Sierra Nevada highlands, Coast Ranges, and forests across northern California, while small tree densities have increased in many regions. These shifts are associated with greater fuel continuity and can increase the potential for high-severity wildfire.

Wildlife ranges are shifting as well. In the Sierra Nevada, 25 of 34 small mammal species surveyed have shifted their elevational ranges over the past century, with upslope movement occurring more than twice as often as downslope movement. For California Tribes, these changes carry cultural as well as ecological consequences: pinyon pines and oaks, whose nuts and acorns are central to food traditions across Tribal statewide, are among the species affected.

Ocean Warming, Acidification, and Coastal Impacts

Ocean acidification and marine heatwaves are altering conditions for marine life, while rising seas are reshaping risks along the coast. Six of the last seven years have seen record marine heatwaves. As atmospheric carbon dioxide concentrations increase, the ocean absorbs more CO₂, changing ocean chemistry in ways that affect the growth and survival of oysters, mussels, crabs, and other ecologically and economically important shell-forming organisms. Sea levels off California are now rising at three times the 20th-century rate. In southern Humboldt Bay, relative sea level rise is rising at 2-3 times the California coastal average, driven in part by local land subsidence. For the Wiyot Tribe, whose homeland encompasses Humboldt Bay, rising water threatens access to traditional cultural sites, subsistence lifeways, and Tribal infrastructure.

Compounding Risks and Uneven Consequences

Taken together, these indicators describe a state in which the consequences of climate change are increasingly visible across water systems, wildfire, human health, terrestrial ecosystems, and the ocean. These changes do not unfold independently. Climate impacts often compound one another, and their consequences are greatest for communities with higher exposure or fewer resources to prepare for and recover from climate hazards, including many Tribes, rural, low-income, and historically marginalized communities. Drought and warming contribute to tree mortality and dry vegetation, increasing wildfire risk. Earlier snowmelt alters summer water availability and river temperatures. Extreme heat can coincide with wildfire smoke, increasing physiological stress. Marine heatwaves can disrupt ecological relationships in ways that persist long after ocean temperatures return to more typical conditions.

California has tracked these indicators for more than two decades, and over that period, the nature of the evidence has changed. Earlier ICC editions established clear trends in temperature, snowpack, sea level, wildfire, and other measures of California's changing climate. This edition increasingly documents what follows from those trends: glaciers disappearing, three consecutive years of commercial salmon fishery closures, extensive forest mortality and vegetation change, and millions of Californians exposed to extreme heat and wildfire smoke at the same time. Some systems change gradually; others can

shift rapidly when multiple pressures converge, with recovery remaining limited long after the initial disturbance has passed. The evidence increasingly shows that these trends are becoming more apparent, more interconnected, and in some cases more persistent. Continued tracking provides the observational record needed to understand these changes, identify where risks are accelerating, and determine where adaptation and recovery may become more difficult. It can also show whether efforts to reduce emissions and protect people and ecosystems are keeping pace with the changes already underway.