CALIFORNIA'S FOURTH
CLIMATE CHANGE
ASSESSMENT

PREVIEW

San Joaquin Valley Region Report

Coordinating Agencies:

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH · STATE OF CALIFORNIA

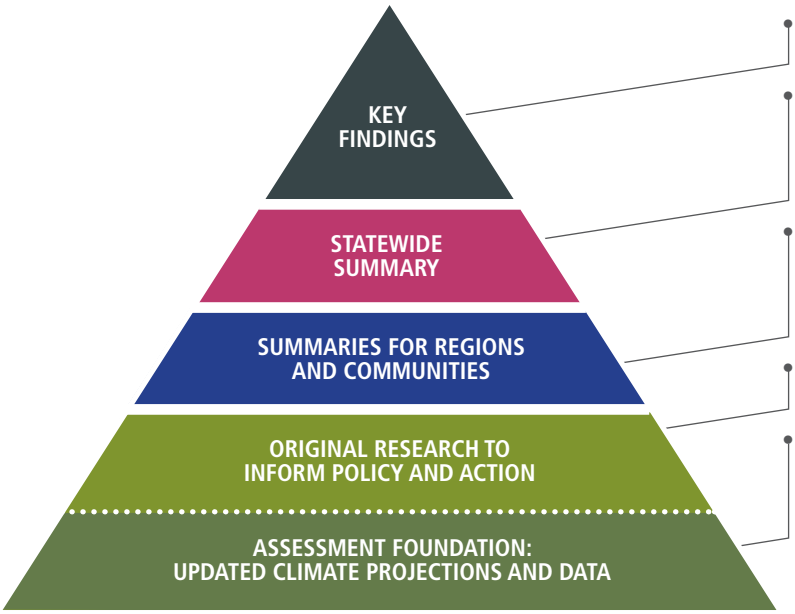
STATE OF CALIFORNIA ENERGY COMMISSION

CALIFORNIA natural resources AGENCY

Introduction to California's Fourth Climate Change Assessment

California is a global leader in using, investing in, and advancing research to set proactive climate change policy, and its Climate Change Assessments provide the scientific foundation for understanding climate-related vulnerability at the local scale and informing resilience actions. The Climate Change Assessments directly inform State policies, plans, programs, and guidance to promote effective and integrated action to safeguard California from climate change.

California's Fourth Climate Change Assessment (Fourth Assessment) advances actionable science that serves the growing needs of state and local-level decision-makers from a variety of sectors. This cutting-edge research initiative is comprised of a wide-ranging body of technical reports, including rigorous, comprehensive climate change scenarios at a scale suitable for illuminating regional vulnerabilities and localized adaptation strategies in California; datasets and tools that improve integration of observed and projected knowledge about climate change into decision-making; and recommendations and information to directly inform vulnerability assessments and adaptation strategies for California's energy sector, water resources and management, oceans and coasts, forests, wildfires, agriculture, biodiversity and habitat, and public health. In addition, these technical reports have been distilled into summary reports and a brochure, allowing the public and decision-makers to easily access relevant findings from the Fourth Assessment.

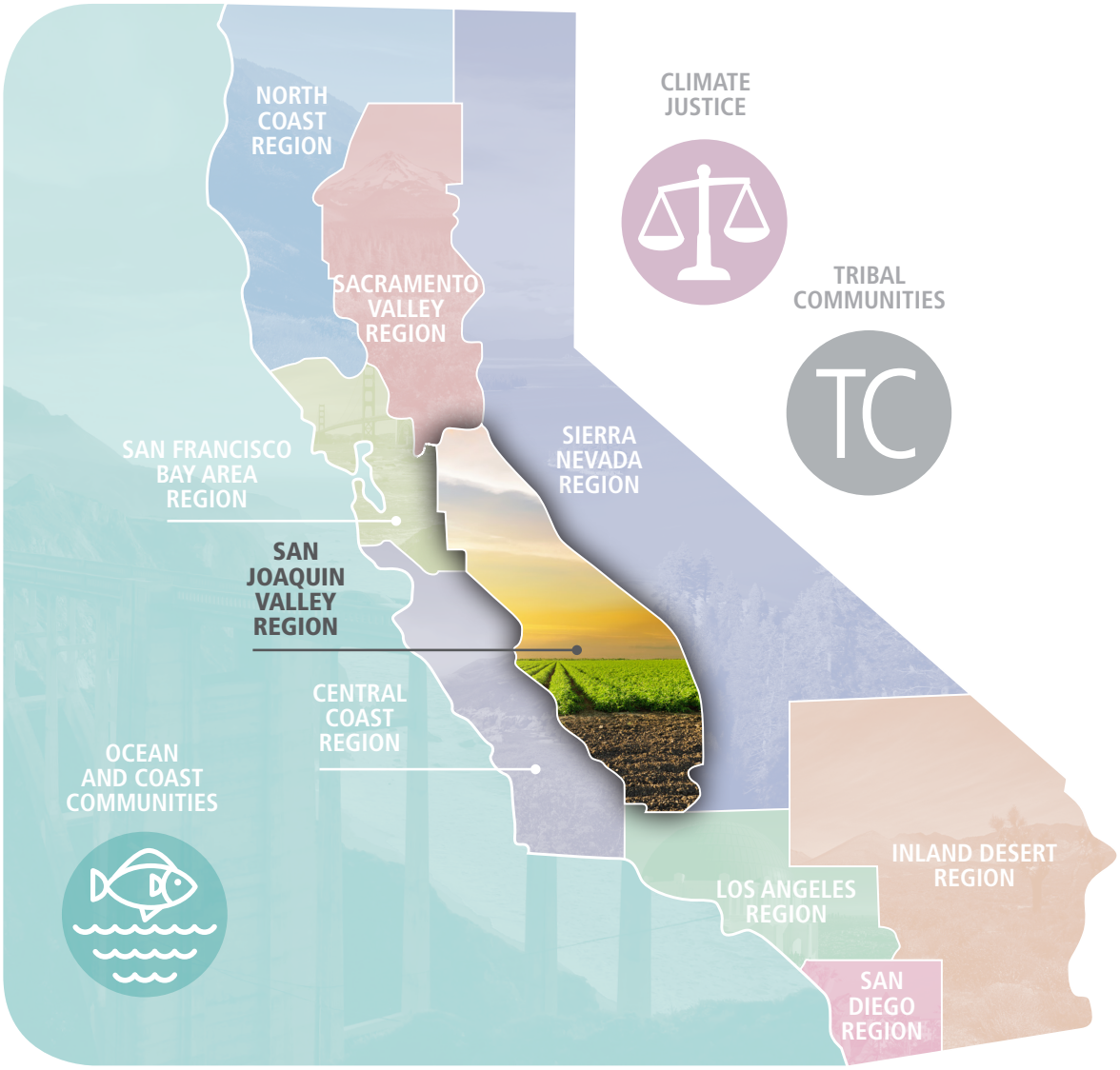


- A concise summary of the Fourth Assessment's most important findings and conclusions.
- An in-depth report on how California's people, built environment, and ecosystems will be impacted by climate change and how we can proactively adapt, based on the Fourth Assessment's findings.
- Reports summarizing Fourth Assessment findings to provide a state of the science for nine regions, the ocean and coast, tribal communities, and climate justice in California.
- Academic research that provides robust and detailed results on resilience and vulnerability to climate change.
- A shared foundation of updated climate change projections, data and ecosystem models developed for use by Assessment authors to permit cross-comparability of results and ensure the findings consider a robust range of future climate conditions. These data are available to the public via Cal-Adapt.org.

All research contributing to the Fourth Assessment was peer-reviewed to ensure scientific rigor as well as, where applicable, appropriate representation of the practitioners and stakeholders to whom each report applies.

For the full suite of Fourth Assessment research products, please visit: www.ClimateAssessment.ca.gov

San Joaquin Valley Region



This document is intended to serve as a preview of the San Joaquin Valley Region summary Report. The final San Joaquin Valley Region Summary Report will be part of a series of 12 assessments to support climate action by providing an overview of climate-related risks and adaptation strategies tailored to specific regions and themes. Produced as part of California's Fourth Climate Change Assessment as part of a pro bono initiative by leading climate experts, these summary reports translate the state of climate science into useful information for decision-makers and practitioners to catalyze action that will benefit regions, the ocean and coast, frontline communities, and tribal and indigenous communities. The final San Joaquin Valley Region Summary Report will present an overview of climate science, specific strategies to adapt to climate impacts, and key research gaps needed to spur additional progress on safeguarding the San Joaquin Valley Region from climate change.

San Joaquin Valley Region Authors

COORDINATING LEAD AUTHORS

Leroy Westerling,
UC Merced

Josue Medellin-Azuara,
UC Merced

Joshua Viers,
UC Merced

CONTRIBUTING AUTHORS

Josh H. Viers
Lorenzo Booth
Julia Burmistrova
Alan Cai
Ariadna Cairo
Selina Davila Olivera
Vicky Espinoza
Anna Fryjoff-Hung
Lindsey Jerome
Jaycee Martinez
Lillie Pennington
Qingqing Xu

CITATION: Westerling, Leroy, Josue Medellin-Azuara, Joshua Viers. (University of California, Merced). 2018. San Joaquin Valley Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-003.

Disclaimer: This report summarizes recent climate research, including work sponsored by the California natural Resources Agency and California Energy Commission. The information presented here does not necessarily represent the views of the finding agencies of the State of California.

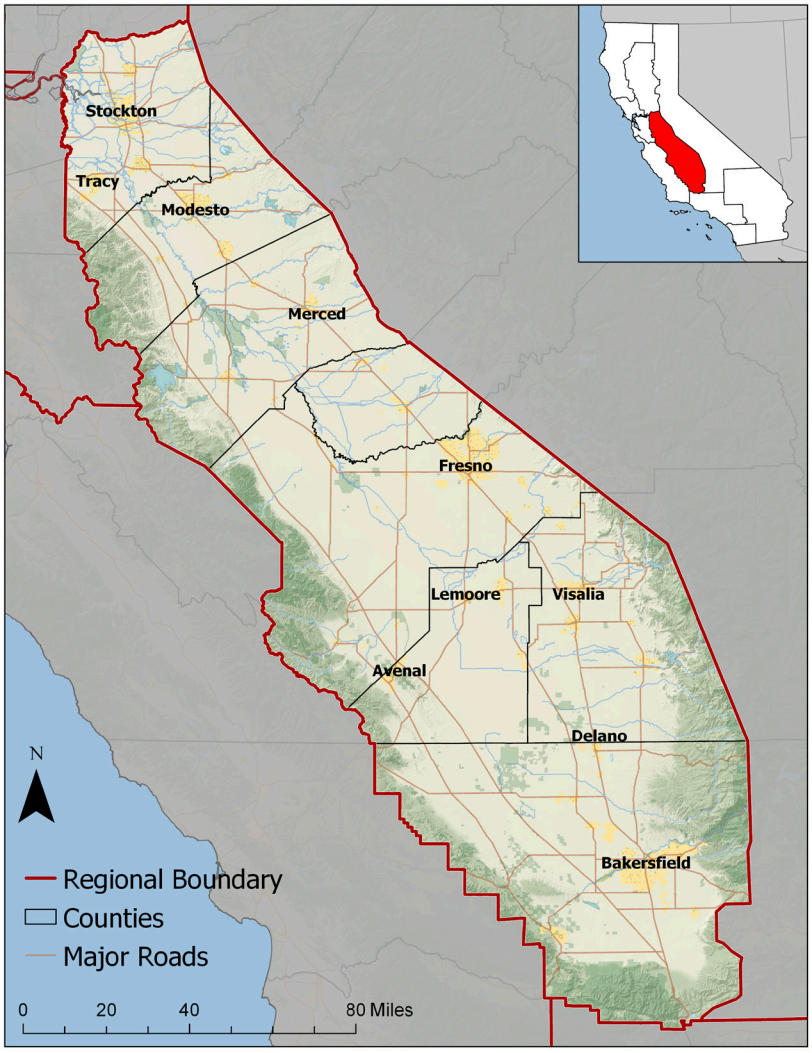
Geography

The San Joaquin Valley Region makes up the southern half of California's Central Valley, a 460-mile basin extending through the heart of the state (Figure 1). The region encompasses the entirety of San Joaquin, Stanislaus, Merced, Kings, and Tulare County and part of Madera, Fresno, and Kern County. The eight counties that compose the region are home to over four million people, more than a tenth of California's population. Fresno is the largest city within the region and the fifth largest city in the state, with a population of over one million. Merced County is the fastest growing county in the state, and the region as a whole is projected to grow significantly through 2060.

Extending southward from the Sacramento-San Joaquin River Delta, the San Joaquin Valley is bounded by the Sierra Nevada to the east, the Tehachapi Mountains to the south, and the Coast Ranges to the west. The San Joaquin River and its tributaries drain the northern half of the valley and flow towards the Delta; the southern half of the valley drains to the closed Tulare Basin, which includes the beds of Tulare, Buena Vista, and Kern lakes. These lakes are dry most of the time as the rivers that historically drained them have been diverted to agriculture. Hot, dry summers and foggy, rainy winters characterize the valley's climate. Home to one of the world's most productive agricultural regions, farming dominates land use in the valley.

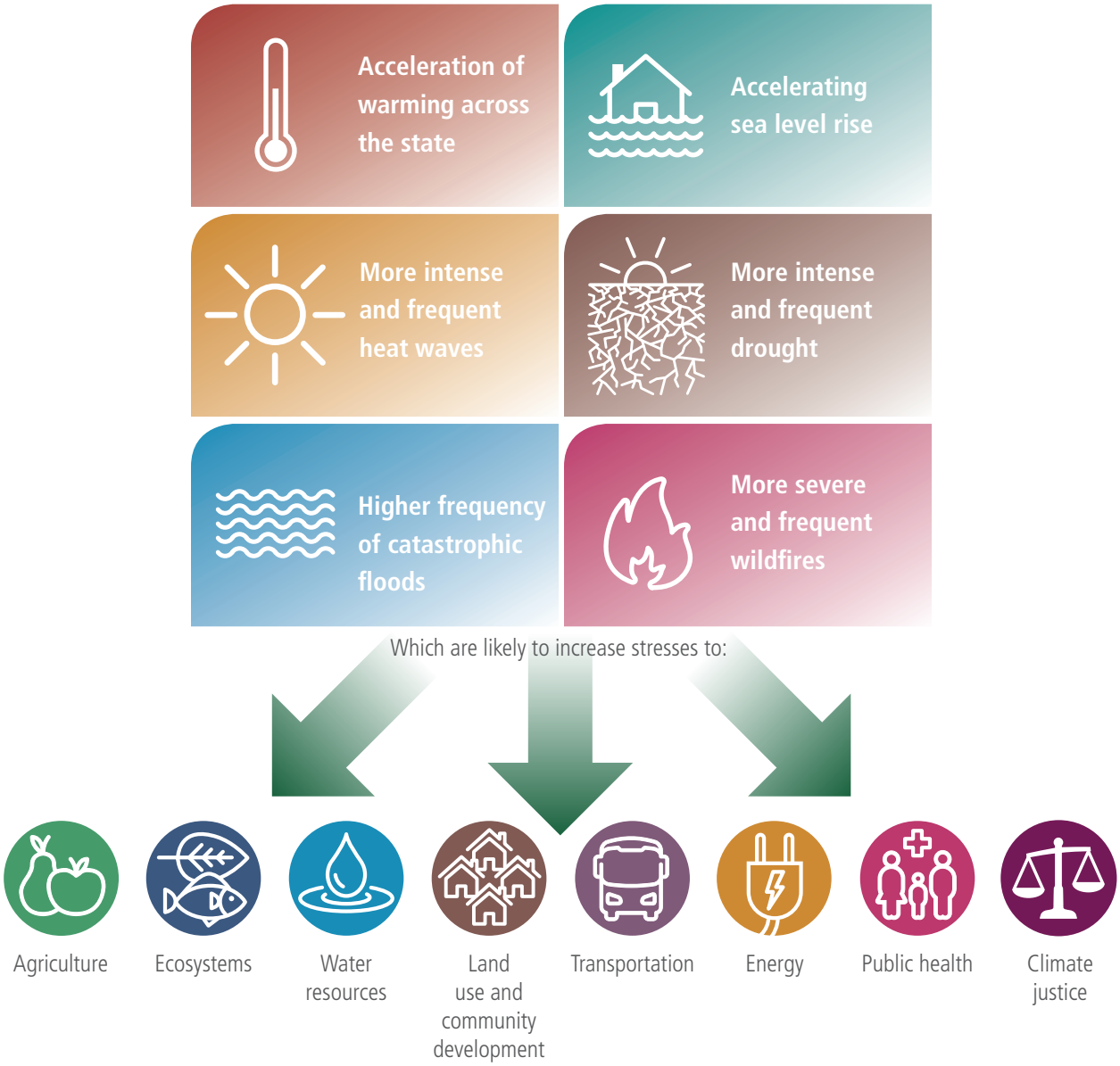
Environmental pressures in the San Joaquin Valley include dry wells and sinking lands due to groundwater overdraft, nitrate contamination of groundwater, local air pollution, and a decline in aquatic, wetland, and terrestrial ecosystems (PPIC, 2. These environmental challenges exacerbate social vulnerability in the valley's poor, rural communities— the valley includes seven of the 10 counties with the highest rates of child poverty in the state.

FIGURE 1



All or part of eight counties compose the San Joaquin Valley region, which makes up the southern portion of the Central Valley. The forested areas of eastern Madera, Fresno, and Kern County fall within the adjacent Sierra Nevada Region.

The forthcoming assessment of potential impacts from climate change in the San Joaquin Valley finds that the region will experience many impacts from climate change. The climate impacts include:



Agriculture is one of the most vulnerable sectors under climate change due in part to more frequent and severe drought, as well as tighter water supply. Sustaining agricultural productivity in the San Joaquin Valley will require improved adaptation and mitigation strategies. In many cases, meeting the standards for climate smart agriculture will involve tradeoffs resulting from shifts in cropping patterns, use of limited water supply, and repurposing of fallowed lands. Regulatory and physical constraints on water supply for agriculture, and environmental factors such as warmer temperatures and more variable precipitation, new pests, and reduced chill hours will affect agricultural decision-making and implementation. Managing sustainable agroecosystems in the San Joaquin Valley will require a systems approach that accounts for resource linkages to other economic sectors, such as water for cities and the environment.

Ecosystems in the San Joaquin Valley are highly vulnerable to climate change given existing antrhopogenic stressors and the lack of organization of landscape-scale science, funding, and mitigation of adverse impacts within the region. This is particularly the case during prolonged droughts when scarce water supply disproportionately impacts ecosystems. Building resilience in ecosystems through active management, developing physical and biological connectivity, and restoring key biophysical processes will greatly improve ecosystem response to acute extreme climate events and chronic anthropogenic stressors.

Water resources within the San Joaquin Valley region will be severely impacted by climate change. Regional climate trends are likely to reinforce naturally highly variable precipitation regimes, but with prolonged periods of drought and pronounced precipitation events. At higher elevations, more precipitation as rain and less as snow will result in a fundamental shift in the hydrologic regime, with greater surface water flows over shorter periods of time. Increased atmospheric temperature during seasonal shifts will result in a change in the timing of snowmelt and more susceptibility to rain-on-snow events from atmospheric rivers. Paradoxically, water years may be characterized as having less water and more flooding. In all, the increased variability in timing and magnitude of surface water will result in a cascade of downstream effects, including changes in reservoir operations for flood protection, less available

CASE STUDY | CITY OF MADERA

Hundreds of California cities and counties have adopted Climate Action Plans (CAPs), which detail climate change mitigation and adaptation efforts in support the State's greenhouse gas reduction targets. For example, the City of Madera adopted its CAP in September 2015. The CAP calls for changes to Madera's General Plan, including: increasing groundwater recharge, encouraging water conservation and use of reclaimed water, adding climate change impacts to utility master plans and service delivery plans, and prohibiting development that does not compensate for added demands on public infrastructure and services.

surface water during seasonal drought (i.e., summer) when irrigation requirements are highest, and decreased water quality. Water quality will be degraded directly, from increased stream temperatures reducing cold water management options for fisheries or from the increase in concentration of contaminants given diminished flows. Changes in irrigation practices, rising concentrations of salts in soils, and an increase in hydrologically disconnected groundwater basins are likely to continue to indirectly degrade water quality.

Groundwater as a source of supply is currently in a perpetual state of overdraft, thus reducing its physical capacity via subsidence and its management capacity to serve conjunctive uses in the future. This imbalance calls for the opportunistic recharge of groundwater during wet years and improved coordinated use of surface and groundwater sources, both of which Sustainable Groundwater Management Act implementation must consider to adequately address this issue. Changes in policy must also improve equity of water distribution in times of water scarcity.

Infrastructure in the San Joaquin Valley, including urban, water, and transportation systems, may face increased stress from higher temperatures and extreme precipitation events, including droughts and floods. Increasing urbanization in the San Joaquin Valley – and uneven land use planning throughout the region – is likely to hinder efficient and cost-effective investments in regional infrastructure. The direct link between the transportation sector and the public health sector point toward exacerbated poor air quality and its direct negative effects on the most vulnerable communities in the San Joaquin Valley. Mitigation strategies to reduce emissions through improved modes of transportation will also have positive effects on public health and climate adaptation. Identifying other opportunities to reduce public health and economic burdens on already disadvantaged communities should be paramount in climate change adaptation planning.

CASE STUDY | ENERGY ROADMAP FOR THE SAN JOAQUIN VALLEY

The Sustainable Energy Roadmap for the San Joaquin Valley (SER) is an example of successful inter-jurisdictional and inter-agency collaboration. SER is a 2015-2016 initiative sponsored by the California's Strategic Growth Council. It brought together 14 San Joaquin Valley jurisdictions with regional planning agencies, industry sources, and technical experts. They exchanged ideas on energy and water efficiency, renewable energy and storage, sustainable transportation and land use, and social equity. Each community prepared an action plan for each topic addressing policies, permitting, planning and zoning, financing, market development, and workforce development. The SER website also maintains a database of best-practices resources. SER is a continuation of efforts to deliver a fair share of state and private funding to the San Joaquin Valley for its clean energy goals.

Public health in the San Joaquin Valley will also be exacerbated by many negative impacts from climate change. Warmer temperatures will facilitate the spread of disease, worsen air quality from extended agricultural fallowing, and challenge food security in disadvantaged communities. At the same time, concentration of pollutants in drinking water, particularly in small community water systems and rural household drinking wells, may increase the incidence of waterborne diseases. Disadvantaged rural communities are likely to experience more intense impacts from extreme events compared to urbanized areas. They are often less equipped to rebound from such events given their rural geography and historic underinvestment, and thus are likely to be disproportionately impacted by economic and environmental stressors under future climate conditions.

CASE STUDY | SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

To reduce emissions from highly-polluting vehicles that contribute to poor air quality in the San Joaquin Valley, the San Joaquin Valley Air Pollution Control District sponsored the "Tune In and Tune Up" (TI&TU) program to provide residents with free emission tests and vouchers for emission-related repairs. Sixty-thousand disadvantaged residents have benefited from this program since 2005. This program not only distributed the majority of its benefits to disadvantaged communities, but also substantially reduced vehicle emissions. TI&TU should be considered a model for balancing efficiency and equity.