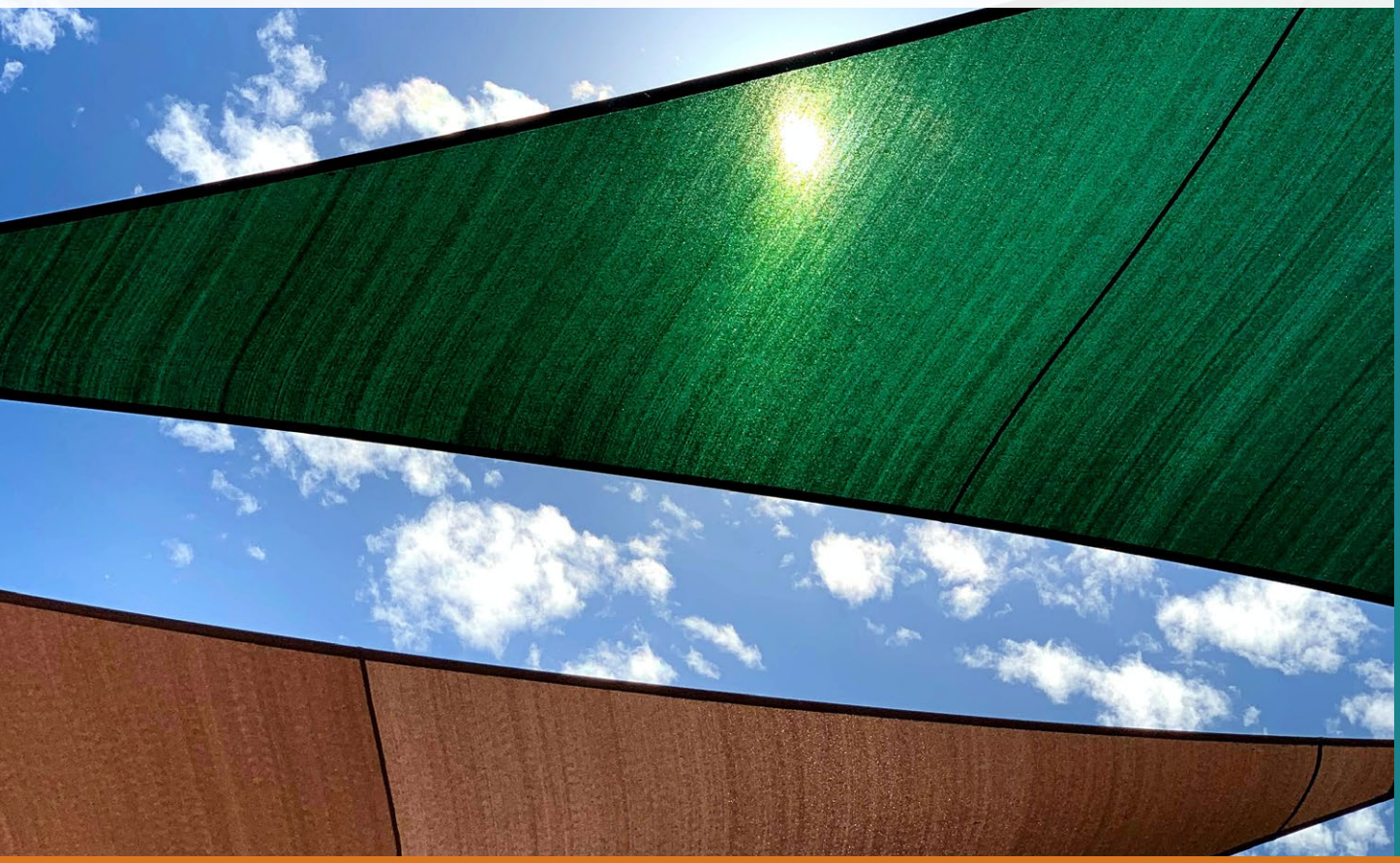
Protecting Californians From Extreme Heat:

A State Action Plan to Build Community Resilience



April 2022

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A State Action Plan to Build Community Resilience

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STATE OF CALIFORNIA
Gavin Newsom, Governor

Thank you to the numerous partners who contributed to this plan.

This Action Plan is located on the
California Natural Resources Agency website:
resources.ca.gov

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Executive Summary

California's best climate science projects that every corner of our state will be impacted in years and decades to come by higher average temperatures and more frequent and severe heat waves. Extreme heat threatens public health and safety; economic prosperity; and communities and natural systems. It also poses profoundly disproportionate consequences for the most vulnerable among us.

This plan outlines a strategic and comprehensive set of state actions to address extreme heat, and serves as an update to the "*Preparing California for Extreme Heat Guidance and Recommendations*" report released in 2013.

The substance and organization of this plan was guided by extensive public input, collected over the course of 2021 and 2022, including through five public listening sessions, ten regional workshops, and numerous consultations with California Native American tribes.

Actions in the plan are organized into four tracks – (A) Build Public Awareness and Notification; (B) Strengthen Community Services and Response; (C) Increase Resilience of Our Built Environment; and (D) Utilize Nature-Based Solutions.

These tracks include established and recommended state actions to address extreme heat. The Administration is committed to continued scoping and exploration of these actions.

Areas of near-term focus include:

- Implement a statewide public health monitoring system to identify heat illness events early, monitor trends, and track illnesses to intervene and prevent further harm.
- Accelerate readiness and protection of communities most impacted by extreme heat, including through cooling schools and homes, supporting community resilience centers, and expanding nature-based solutions.
- Protect vulnerable populations through codes, standards, and regulations.
- Expand economic opportunity and build a climate smart workforce that can operate under and address extreme heat.
- Increase public awareness to reduce risks posed by extreme heat.
- Protect natural and working lands, ecosystems, and biodiversity from the impacts of extreme heat.

Introduction

California's best climate science projects that every corner of the state will be impacted in years and decades to come by higher average temperatures and more frequent and severe heat waves. These changes will pose a risk to every region and sector across natural, built, and social systems. The 2022 Action Plan outlines California's all-of-government approach to mitigating the health, economic, cultural, ecological, and social impacts of increasing average temperatures and heat waves. It constitutes California's response to what has become known as "extreme heat" and accompanying "extreme heat events."

What is Extreme Heat and What are its Impacts?

Climate change is increasing temperatures across the planet and in California. Extreme heat refers to temperatures that are well above normal conditions, and extreme heat events are consecutive unusually hot days and nights for a given area. Different regions of our state experience extreme heat differently; some areas accustomed to hot temperatures are experiencing very hot conditions while other areas that have been historically cool are experiencing warmer temperatures. Increasing temperatures also impact people differently. For vulnerable people, including older populations, children, and those with certain health conditions, and for people with limited or no access to cooling or shade, extreme heat can be dangerous – even deadly. This Action Plan responds to extreme heat as it is experienced differently across California and seeks to support tailored approaches across California's diverse microclimates.

Average annual temperature increases experienced over most of California have already exceeded 1°F, with some areas exceeding 2°F, when comparing the average from 1901-1960 to 1986-2016.[1] The daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise 4.4°F – 5.8°F by 2050 and 5.6°F – 8.8°F by 2100.[2] Heat waves that result in public health impacts, also referred to as heat-health events, are also projected to worsen throughout the state. By 2050, average heat-health events are projected to last two weeks longer in the Central Valley and four to ten times more often in the Northern Sierra region.[3]

1 Bedsworth, L., D. Cayan, G. Franco, L. Fisher, S. Ziaja. (California Governor's Office of Planning and Research, Scripps Institution of Oceanography, California Energy Commission, California Public Utilities Commission). 2018. *Statewide Summary Report, California's Fourth Climate Change Assessment*. Publication number: SUMCCCA4-2018-013, 22.
2 Ibid, 23.
3 Ibid, 10.

Heat ranks amongst the deadliest of all climate-driven hazards in California, and heat waves in cities are projected to cause two to three times more heat-related deaths by mid-century.[4] *Climate vulnerable communities* will experience the worst of these effects, as heat risk is associated and correlated with physical, social, political, and economic factors.[5] Older populations, infants and children, pregnant people, and people with chronic illness can be especially sensitive to heat exposure. Combining these characteristics and existing health inequities with additional factors, such as poverty, linguistic isolation, housing insecurity, and the legacy of racist redlining policies, can put individuals at disproportionately high risk of heat-related illness and death.[6]

Extreme heat also threatens California's natural systems. Increasing temperatures, for example, lead to exacerbated risk of wildfire; drought and its effects on the health of watersheds; and the direct effects of heat on plants and animals resulting in reduced fitness, increased stress, migration, and death. These shifts result in significant cultural impacts to tribes, where plants and animals that have been used as traditional food, medicine, materials, or in ceremony are no longer present.

This Action Plan leverages expertise across state government to address the broad range of impacts of extreme heat on California and builds a strong foundation for enhanced and equitable climate change adaptation.

Updating California's Response

In 2013, the state released *Preparing California for Extreme Heat: Guidance and Recommendations*. The document summarized climate projections for increased temperature and extreme heat conditions for California and presented state agency recommendations. Coordinated by the California Department of Public Health and the California Environmental Protection Agency, the report's recommendations focused on addressing extreme heat's impacts on human health. This document updates and builds upon actions initiated in the 2013 report.

The substance and organization of this draft Extreme Heat Action Plan were guided by extensive public engagement. In addition to input received through ten regional workshops and numerous consultations with California Native American tribes, the state held a series of Extreme Heat Listening Sessions to gather recommendations on priority state actions and areas of focus for the Action Plan.

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4 Ostro, B., Rauch, S., & Green, S. (2011). *Quantifying the health impacts of future changes in temperature in California*. Environmental Research, 111(8), 1258–1264.

5 Basu, R. (2009). *High ambient temperature and mortality: a review of epidemiologic studies from 2001 to 2008*. Environmental Health, 40 (8). ; Basu, R. & Malig, B. (2011). *High ambient temperature and mortality in California: Exploring the roles of age, disease, and mortality displacement*. Environmental Research, 111(8). .

6 Ibid ; Hoffman, J., Shandas, V., & Pendleton, N. (2020). *The effects of historical housing policies on resident exposure to intra-urban heat: A study of 108 US urban areas*. Climate, 1(8).

Actions in the plan are organized into four tracks: A) Build Public Awareness and Notification; B) Strengthen Community Services and Response; C) Increase Resilience of the Built Environment; and D) Utilize Nature-based Solutions. These tracks include existing and recommended state actions to address extreme heat.

It will require time, effort, and funding to carry out these strategies. The pace of implementation will depend upon our collective effort and the feasibility and availability of resources. The 2021 Budget included a $300 million General Fund set aside over two years to support investments that reduce urgent risks and build long-term resilience to the impacts of extreme heat across California. The Administration will use the Extreme Heat Action Plan to determine investments prioritized for implementation with this funding set aside.

Moving forward this plan will be integrated into California's Climate Adaptation Strategy, which nests elements of relevant state plans and identifies how they collectively drive on key climate resilience priorities. Progress on the Extreme Heat Action Plan will be tracked through the Climate Adaptation Strategy's annual implementation reporting process.

Legend: How to Read the Action Plan

Each of the four Action Tracks include two types of actions:

1. Established actions.
2. Recommended (new) actions to strengthen resilience to extreme heat. Recommended actions address important needs, and implementation may require additional or new resources. The Administration is committed to continued scoping and exploration of these actions.

Connection to the 2013 Report:

Actions included in the plan, that were also called for in the 2013 report, include an implementation note, summarized as follows:

1. **Completed** = actions that are fully implemented, with links and reference to deliverables or products.
2. **Ongoing** = actions that are still in progress or don't have a final completion date (require sustained actions).
3. **Not Completed** = actions that have not yet been implemented but where, for established actions, existing programs and/or resources are identified and secured, and, for recommended actions, resources are needed.


°C °F
50 120
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30 80
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10 40
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−30

Action Track A: Build Public Awareness and Notification

Extreme heat threatens public health and safety; economic prosperity; and communities and natural systems – and yet these risks are not well understood. For decades, Californians, especially in regions with the warmest climates, have mobilized and prepared for seasonal hot days and extreme heat events. However, as temperatures increase and heatwaves become lengthier, more frequent, and dangerous, it is critical that communities across the state have access to information that directly relates to their unique heat risk, adaptive capacity, and available resources. Building public awareness and understanding of extreme heat events and the risks they pose, as well as providing notification when these events are predicted to occur, is therefore a critical area of focus for the state of California.

The Public Awareness track includes key communications and information actions from across the Administration, including established and new public outreach and education efforts, as well as research and data provision activities.

These actions reflect the Administration's commitment to prioritizing the needs of our most heat vulnerable communities, by providing timely and actionable information and communication strategies to people experiencing housing insecurity, outdoor workers, older adults, young children, and people with certain existing health conditions. The Public Awareness track also includes actions that equip decision-makers with easily accessible data, best available climate science and heat modeling, and research needed to assess heat risk and make well-informed decisions.

The state's actions in the Public Awareness track are organized around three goals:

1. Build public awareness about extreme heat through targeted communications campaigns,
2. Support actionable climate science and research to inform risk assessments and decision-making, and
3. Improve accuracy and accessibility of heat modeling and data to inform decision-makers.

Track A - Goal 1: Build public awareness about extreme heat through targeted communications campaigns

Established Actions

TRACK A - GOAL 1, E1:

Implement existing actionable and targeted public awareness campaigns, prioritizing outreach to communities most vulnerable to heat impacts.

- The Department of Public Health's *Emergency Preparedness Office* provides fact sheets and web-based content for the public on how to stay safe during extreme heat, disseminates information to local health departments and emergency networks, and coordinates communications through the CA Health Alert Network. This includes *information for priority populations*.
- In collaboration with StoryCenter, Tracking California, and Lideres Campesinas, the Department of Public Health's Climate Change and Health Equity Section supported the creation of digital stories narrated by community residents about adverse social, economic, and health impacts from extreme heat events. Two of these stories are narrated by Indigenous farmers in the Mixteco language.
- The Department of Aging publishes *Resources for Staying Safe During Extreme Heat* tailored for older adults and adults with disabilities, as well as for other priority populations.
- The Department of Industrial Relation's Division of Occupational Safety and Health continues to improve and expand its stakeholder communication channels prior to and during high heat events, including issuing coordinated public awareness materials on the Heat Illness Prevention Standard when the National Weather Service issues multiple excessive heat watches or warnings.
- The *99 Calor Campaign* targets outdoor workers with Heat Illness Prevention materials, discussion guides in multiple languages, and external communications about Department of Industrial Relations Division of Occupational Health and Safety's Heat Illness Prevention Standard.

- Since 2010, the Department of Industrial Relations has managed a public awareness campaign for employers and workers in multiple languages. The campaign includes radio public service announcement in multiple languages, outdoor advertisements in multiple languages, and paid social media advertisements targeted at agriculture and construction workers in English and Spanish.
- The Office of Emergency Services releases an annual *#BeattheHeat Campaign and collection of Summer Heat Resources*.
- The Office of Emergency Services' California State Warning Center is used as a situational awareness pass through for heat alerts, watches, and warnings received daily by the National Weather Service for all emergency management partners, including tribal emergency managers.
- The Office of Emergency Services maintains the 2014 Contingency Plan for Excessive Heat Emergencies (currently being updated as part of the draft Extreme Temperature Response Plan) and the *2020 Electric Power Disruption Toolkit for Local Government*. Both documents contain information on public awareness campaigns and information on cooling centers.

Agencies:
Health and Human Services Agency; Department of Aging, Department of Public Health | Labor Workforce and Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Governor's Office of Emergency Services

Recommended Actions

TRACK A - GOAL 1, R1:

Support public awareness campaigns that build upon current efforts to bolster extreme heat event preparedness actions and adaptation strategies.

- Public awareness efforts should be culturally and linguistically appropriate, accessible, and targeted at vulnerable populations who are disproportionately impacted by the effects of extreme heat.
- Outreach efforts should leverage local partners and harness trusted messengers to deliver information on resiliency in a community-focused manner.
- Campaigns should build off the best practices and lessons learned from other recent, successful public awareness initiatives like the California Complete Count–Census 2020, LISTOS California and the California Tobacco Control campaign.

Agencies: Governor's Office of Planning and Research; Planning and Policy, California Volunteers | Governor's Office of Emergency Services| Environmental Protection Agency; State Water Resources Control Board | Labor and Workforce Development Agency; Workforce Development Board, Department of Industrial Relations Division of Occupational Safety and Health | Natural Resources Agency;

State Lands Commission, Energy Commission, Department of Water Resources, Delta Stewardship Council, Coastal Commission |Health and Human Services Agency; Department of Public Health | Department of Food and Agriculture | Department of Education

TRACK A - GOAL 1, R2:

Support employers to protect worker health from extreme heat.

- Conduct outreach to organizations representing employers, with a focus on smaller employers and those employing vulnerable worker populations, to inform them about extreme heat risks, applicable regulations, and resources for assistance in minimizing risks. This action was called for in the 2013 Report and is a continuing need. The Department of Public Health has provided limited outreach and education on heat illness prevention to employers of outdoor workers. Outreach is also needed for employers of indoor workers on heat illness prevention.

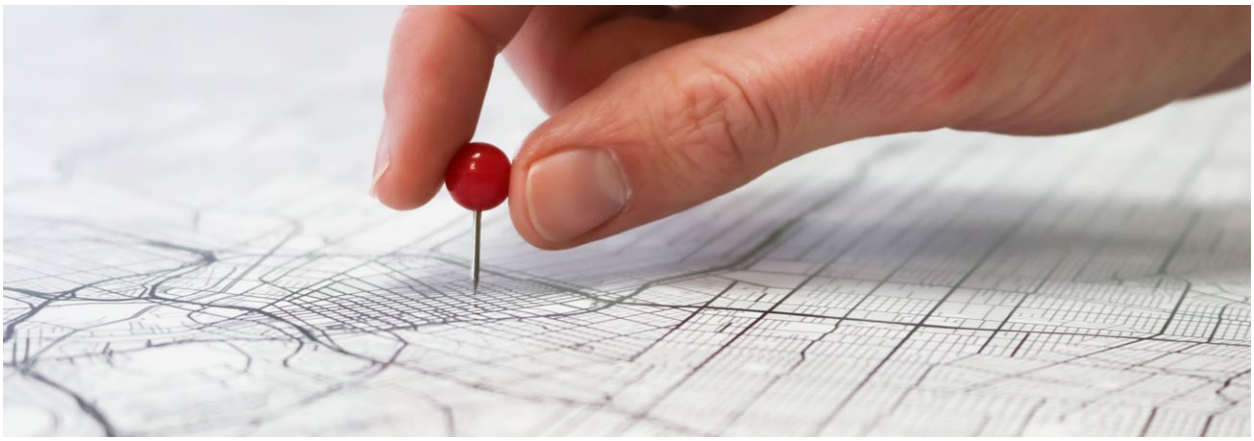
Agency: Health and Human Services Agency; Department of Public Health Occupational Health Branch

TRACK A - GOAL 1, R3:

Support a comprehensive outreach campaign to prevent heat related illnesses among children, seniors, and people with disabilities in the care of licensed facilities.

- The campaign would target support for facilities most impacted by extreme heat with the least capacity to protect those in their charge. This includes, but is not limited to, facilities located in areas of the state where seasonal temperatures regularly reach above 90 degrees; facilities that serve residents and clients who are Supplemental Security Income recipients; facilities that serve seniors and people with disabilities (including but not limited to skilled residential care facilities); facilities that serve families eligible for state subsidized childcare; and licensees/workforce and residents/clients/children that primarily use English as a Second Language.

Agency: Health and Human Services Agency; Department of Public Health, Department of Social Services



Track A - Goal 2: Support actionable climate science and research to inform risk assessments and decision-making

Established Actions

TRACK A - GOAL 2, E1:

Identify the characteristics of vulnerable populations and communities that are highly resilient to heat. Use statistical approaches to determine vulnerable subgroups (i.e., by age, education level, income, and other demographic indicators) for regions or counties.

- A collection of resources produced by the Department of Public Health and the Office of Environmental Health Hazard Assessment identified characteristics of populations facing heightened heat risk and equip decision-makers with the information to pinpoint those populations in their community. This action was called for in the 2013 Report and implementation is ongoing.
- Resources developed to date include:
    - The Department of Public Health's *Climate Change and Health Vulnerability Indicators for California and their visualization platform* estimate vulnerability by census tract or smallest scale available for every county in California, including population sensitivity and adaptive capacity indicators related to extreme heat.
    - The Fourth Climate Change Assessment's *California Heat Assessment Tool* was developed for local and state health practitioners to better understand heat vulnerability and identify where actions can be taken to prevent and reduce public health impacts of extreme heat events.
    - The Office of Environmental Health Hazard Assessment has contributed to a growing *body of literature* linking harmful health effects to increasing temperatures and heat waves and has helped identify groups who are most vulnerable to heat-related mortality and illness.

Agencies: Health and Human Services Agency; Department of Public Health | Environmental Protection Agency; Office of Environmental Health Hazard Assessment

TRACK A - GOAL 2, E2:

Support an open, accessible, user-friendly, and integrated platform that holistically identifies communities vulnerable to climate change impacts, including heat.

- This platform will allow decision makers to determine which communities face increased vulnerability during extreme heat events.

Agencies: Governor's Office of Planning and Research; Planning and Policy, in partnership with relevant agencies

TRACK A - GOAL 2, E3:

Support actionable research and science to inform heat adaptation and resilience actions.

- The *Indicators of Climate Change in California* describe how California's climate is changing, including increasing frequency and severity of extreme heat events, and how these changes are affecting the state.
- *Recent Research on Climate Change in California: A bibliography* is a compilation of information relevant to climate change and its impacts as a source of current and emerging scientific information on climate change, including extreme heat.
- The Office of Environmental Health Hazard Assessment conducts and releases *human health studies* relating increased temperatures to adverse health outcomes.
- The California Climate Change Assessments fund applied climate research to increase our understanding of how climate change is projected to impact California, including heat.

Agencies: Health and Human Services Agency; Department of Public Health | Environmental Protection Agency; Office of Environmental Health Hazard Assessment | Governor's Office of Planning and Research; Planning and Policy, Strategic Growth Council | Natural Resources Agency; Energy Commission

TRACK A - GOAL 2, E4:

Develop regionally specific vulnerability assessments that identify communities with the highest social vulnerability to climate impacts, meaning communities with high sensitivity and low adaptive capacity to climate impacts, including extreme heat.

- A number of regionally specific vulnerability assessments have been completed and include extreme heat, including:
    - The *2019 Caltrans Climate Change Vulnerability Assessments* were completed statewide, including for *Los Angeles and Ventura*, *Inyo, Mono and Eastern Kern*, and *Riverside and San Bernardino* Counties.

- The Delta Stewardship Council's *Delta Adapts: Creating a Climate Resilient Future*.
- The Tahoe Conservancy's *Integrated Vulnerability Assessment of Climate Change in the Lake Tahoe Basin*.
- The San Francisco Bay Conservation and Development Commission's *Adapting to Rising Tides: Vulnerability & Risk Assessment Report – Alameda County*.
- The Department of Water Resources' *Climate Change Vulnerability Assessment* (2019) and *Climate Change Adaptation Plan* (2020).
- Sierra Nevada Conservancy funded the *Sierra Nevada Regional Climate Vulnerability Assessment* all of the 22 counties of the Sierra Nevada. The overall project is expected to be completed by June 30, 2022.
- The California Department of Forestry and Fire Protection *California's 2017 Forest and Rangelands Assessment*, specifically, Chapter 3.2 (Urban Forestry).

Agencies: Natural Resources Agency; Delta Stewardship Council, Sacramento-San Joaquin Delta Conservancy, Tahoe Conservancy, Department of Water Resources, San Francisco Bay Conservation and Development Commission, Sierra Nevada Conservancy, Department of Forestry and Fire Protection |State Transportation Agency; Caltrans

TRACK A - GOAL 2, E5:

Evaluate and improve the effectiveness of early heat warning systems geared toward populations at risk, including addressing community-level impacts.

- The Department of Public Health is exploring opportunities to improve Heat-Health Warnings utilizing the California Heat Assessment Tool and is assessing the feasibility of collaborating with other agencies, including the National Weather Service, to base heat alert warnings in California on health-based thresholds rather than historical averages. This action was called for in the 2013 Report and implementation is ongoing.

Agencies: Health and Human Services Agency; Department of Public Health | Environmental Protection Agency; Office of Environmental Health Hazard Assessment | Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Natural Resources Agency; Office of State Climatologist, Department of Water Resources |Governor's Office of Emergency Services| Department of Food and Agriculture | Governor's Office of Planning and Research; Planning and Policy

TRACK A - GOAL 2, E6:

Identify heat adaptation strategies with health co-benefits.

- The Department of Public Health's *Climate Change and Health Equity Section* provides health equity analysis and input to local and state agencies' climate change-related plans, policies, and investments,

including those regarding heat adaptation strategies. In addition, the Section hosts a *Toolkit* that outlines a collection of Public Health Adaptation Plans, actions, and other resources that walk users through the steps of planning for the health impacts of climate change. This action was called for in the 2013 Report and implementation is ongoing.

- The Governor's Office of Planning and Research's *State Adaptation Clearinghouse* supports a community of practice on adaptation and resilience and includes a suite of resources on extreme heat, such as examples of local heat adaptation plans, including identification of those that also provide health benefits. This action was called for in the 2013 Report and implementation is ongoing.

Agencies: Governor's Office of Planning and Research; Planning and Policy, in partnership with relevant agencies | Health and Human Services Agency; Department of Public Health | Environmental Protection Agency; California Air Resources Board, Office of Environmental Health Hazard Assessment

TRACK A - GOAL 2, E7:

Evaluate energy and cost-efficient strategies that could provide protection against heat and air pollution for vulnerable populations.

- The Public Utilities Commission developed and implemented the *Environmental and Social Justice Action Plan* (2019), which committed the Commission to increasing investment in clean energy resources to benefit Environmental and Social Justice communities, especially to improve local air quality and public health and to increase climate resiliency. The Public Utilities Commission released a draft of the updated Environmental and Social Justice Action Plan 2.0 in October 2021. This action was called for in the 2013 Report and implementation is ongoing.
- The Public Utilities Commission oversees various energy efficiency programs, including the Energy Savings Assistance program which provides low-income eligible customers with no-cost home weatherization and energy efficiency measures, and ventilation and air conditioning system equipment. These investments help these customers during extreme heat events, while reducing energy consumption and costs. In 2021, the Public Utilities Commission approved a Decision authorizing $2.2 billion for the Energy Savings Assistance program through 2026 as well as a new customer-centered prioritization model to better target these investments and help mitigate the impacts of extreme heat event for the most vulnerable populations. This action was called for in the 2013 Report and implementation is ongoing.

Agencies: Natural Resources Agency; Energy Commission, Department of Forestry and Fire Protection | Public Utilities Commission | Environmental Protection Agency; California Air Resources Board | Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Government Operations Agency; Building Standards Commission | Business,

Consumer Services and Housing Agency; Housing and Community Development

TRACK A - GOAL 2, E8:

Address the impacts of extreme heat events and wildfires on health hazard assessments and support science-based guidance for state agencies, medical and public health providers, school authorities, and the public.

- The Office of Environmental Health Hazard Assessment provides information that integrates evolving scientific understanding and the clinical health implications, particularly in vulnerable populations such as children, older adults, and pregnant people.
- The California Air Resources Board's *Climate Heat Impact Response Program* mitigates the emissions from increased electricity generation due to extreme heat events. This program requires emissions mitigation through various zero emission projects.

Agency: Environmental Protection Agency; Office of Environmental Health Hazard Assessment, California Air Resources Board

TRACK A - GOAL 2, E9:

Continue to incorporate extreme heat and impacts on energy demand into Integrated Energy Policy Report forecasts.[7]

- These forecasts flow directly into the Public Utilities Commission and California Independent System Operator electric system planning activities, which assess grid impacts and identifies where system upgrades may be needed. [8]

Agency: Natural Resources Agency; Energy Commission | Public Utilities Commission | California Independent System Operator

7 Javanbakht, Heidi, Cary Garcia, Ingrid Neumann, Anitha Rednam, Stephanie Bailey, and Quentin Gee. 2022. Final 2021 Integrated Energy Policy Report Volume IV: California Energy Demand Forecast. California Energy Commission. Publication Number: CEC-100-2021-001-V4. Pages 16-18.

8 Ibid. pages 27-30

Recommended Actions

TRACK A - GOAL 2, R1:

Support the development of a framework for designing studies that assess the impact of heat exposure on individuals (personal heat exposure assessment studies).

- These studies can be used by local health departments to monitor high-risk populations within their communities, including athletes, aging populations, outdoor workers, and firefighters, and to provide tailored interventions based on individual needs.

Agency: Environmental Protection Agency; Office of Environmental Health Hazard Assessment

TRACK A - GOAL 2, R2:

Support research that quantifies the economic impacts of excess deaths from past extreme heat events and develop decision-support tools to project these impacts under future climate change scenarios to guide heat adaptation and resilience actions.

Agencies: Health and Human Services Agency; Department of Public Health | Governor's Office of Planning and Research; Planning and Policy | Natural Resources Agency; Energy Commission

TRACK A - GOAL 2, R3:

Support analyses of heat-related illnesses, including equity analyses, and produce reports and visualizations to inform public health action.

- Provide guidance to local health departments and tribal health programs to integrate extreme heat into health plans and assessments, as well as Public Health Emergency Preparedness and Hospital Preparedness Programs.

Agency: Health and Human Services Agency; Department of Public Health

Track A - Goal 3: Improve accuracy and accessibility of heat modeling and data to inform decision-makers

Established Actions

TRACK A - GOAL 3, E1:

Develop an urban heat island effect index, including a definition consistent with the legislative intent in Assembly Bill 296 (2012), and assess the extent and severity of the urban heat island effect for California cities to inform quantifiable reduction goals.

- The California Environmental Protection Agency released a study in 2015 entitled "*Creating and Mapping an Urban Heat Island Index for California*" that defined and examined the characteristics of an urban heat island and produced a series of interactive maps that shows the urban heat island effect for each census tract in and around most urban areas throughout the state. This action was called for in the 2013 Report and implementation is complete.

Agencies: Environmental Protection Agency; Office of Environmental Health Hazard Assessment, California Air Resources Board |Governor's Office of Planning and Research; Planning and Policy |Government Operations Agency; Department of General Services, Building Standards Commission | Health and Human Services Agency; Department of Public Health | Natural Resources Agency; Energy Commission, Department of Forestry and Fire Protection| State Transportation Agency; Caltrans

TRACK A - GOAL 3, E2:

Conduct analysis on heat-related illnesses by industry and occupation to inform tailored prevention activities.

- The Department of Public Health completes the *California Occupational Health Indicators* report every three years, which provides analysis on workers employed in California and the key indicators or measures of how the work environment, including heat, affects health.

Agency: Health and Human Services Agency; Department of Public Health Occupational Health Branch

TRACK A - GOAL 3, E3:

Collect and maintain observed and projected heat-related data to inform heat adaptation actions.

- *Cal-Adapt* houses the state's downscaled climate projection data, including current and projected data on Extreme Weather, Extreme Heat Days & Warm Nights, and Cooling Degree Days & Heating Degree Days. It also includes a new *Extreme Weather Tool (beta)* to explore extreme weather events, including heat.
- An *MOU between the CA state government and the California Institute of Technology Jet Propulsion Laboratory* is exploring opportunities to utilize remote sensing data, field measurements, and models to improve California's resilience to challenges magnified by climate change.

Agencies: Natural Resources Agency; Energy Commission | Governor's Office of Planning and Research; Planning and Policy | Department of Food and Agriculture | Environmental Protection Agency

Recommended Actions

TRACK A - GOAL 3, R1:

Report near real-time data on heat-related illnesses during heat waves through implementation of a robust, statewide syndromic surveillance system.

- Syndromic surveillance systems provide monitoring capabilities on health conditions and symptoms in near real-time from hospital emergency departments. Full participation across the state in such a system would provide near real-time data to identify heat illness events early, monitor trends, and track illnesses, and therefore support officials to respond quickly to minimize health risks from extreme heat events. The Department of Public Health has the capacity to report on syndromic surveillance data, but additional resources are needed to increase the uptake of use of this system throughout the state (only 46 of 320 emergency departments are currently reporting data). This action was called for in the 2013 Report and implementation has not been completed.
    - The Department of Industrial Relations Division of Occupational Safety and Health would benefit from this data to determine locations for high-inspection enforcement inspections, education, and outreach efforts.
    - The Office of Emergency Services Law Enforcement Branch would benefit from a robust surveillance system since the Branch tracks high mortality rates due to heat events and provides support to local law enforcement with Coroner Mutual Aid, if requested.

Agency: Health and Human Services Agency; Department of Public Health

TRACK A - GOAL 3, R2:

Modernize the Electronic Death Registration System to register heat-related deaths to facilitate interventions and prevent additional deaths.

Agency: Health and Human Services Agency; Department of Public Health

Action Track B: Strengthen Community Services and Response

The burden of extreme heat falls disproportionately on the most vulnerable among us, including California Native American tribes, rural, and economically disadvantaged communities. For example, many rural communities in California have insufficient infrastructure systems to support upgrades or other investments that support cooling actions. In urban areas, formerly redlined and marginalized communities are generally hotter than neighboring affluent communities, and case studies of cities across California suggest heat stress is unequally distributed across income groups.

The Community Services and Response track includes a suite of actions that reduce heat exposure and build community adaptive capacity, support local climate adaptation planning and implementation, and advance temperature standards for indoor and outdoor workers.

The state's actions in the Community Services and Response track are organized around three goals:

1. Invest in social resilience,
2. Protect California's workers and economy from the impacts of extreme heat, and
3. Support local planning and response measures to extreme heat events.

Track B - Goal 1: Invest in social resilience

Established Actions

TRACK B - GOAL 1, E1:

Convene health and social service providers from multiple sectors, including state and local agencies, and researchers who are developing state-of-the-art vulnerability mapping techniques, mitigation and adaptation strategies, and other information to identify strategies to increase community resilience by improving social infrastructure, such as places and organizations that foster cohesion and support.

- State agency efforts support the development of strategies that increase community resilience by improving social infrastructure. This action was called for in the 2013 Report and implementation is ongoing. Resources and programs developed to support implementation of this action include:
  - *Planning and Investing for a Resilient California* provides guidance for state agencies to help identify climate vulnerable communities for investment, conduct community engagement, and apply an "equity checklist" to decisions and projects.
  - *Partners Advancing Climate Equity* builds capacity for frontline community leaders in California. Participants receive monetary support, in-depth training, and mentorship that cultivates skills in leveraging available resources to advance local climate resilience and social equity priorities and navigating state funding programs, policies, resources, and decision-making processes.
  - *California Climate Investments Technical Assistance Program* supports communities in applying to the CCI funding programs, several of which fund projects that can mitigate extreme heat. This assistance aims to level the playing field for applicants that may lack the capacity to access funds successfully.
  - The *California Climate Action Corps* is enhancing adaptive capacity of

communities and advancing local climate adaptation planning through increased climate-related service.

Agencies: Governor's Office of Planning and Research; Strategic Growth Council, California Volunteers | Environmental Protection Agency; California Air Resources Board | Health and Human Services Agency; Department of Public Health

TRACK B - GOAL 1, E2:

Support Community Resilience Centers that advance community-led efforts to build new or retrofit existing facilities that will serve as centers to help vulnerable residents withstand the impacts of extreme heat, wildfires, power outages, flooding, and other emergency situations brought about by climate change.

- The Department of Food and Agriculture will invest in Community Resilience Centers with funding through the 2021 Budget, including but not limited to leveraging California's fairgrounds.
- The Strategic Growth Council will establish a Community Resilience Centers Grant Program in FY 22-23.

Agencies: Department of Food and Agriculture | Governor's Office of Planning and Research; Planning and Policy, Strategic Growth Council

Recommended Actions

TRACK B - GOAL 1, R1:

Develop a "Cool Buddy" program to identify heat-vulnerable people and reach out and check on them during heat events.

- This program can be advanced through support for small community-based organizations in collaboration with local health, social service, and emergency management departments and can build social capital and community cohesion throughout the year.
- The California Volunteers Neighbor to Neighbor program builds strong connections and relationships between neighbors. Leaders are trained to build neighborhood networks, identify vulnerable neighbors, and set up systems to check in on each other during emergencies, like extreme heat events. The proposed Senior Companion volunteer program is another opportunity to increase check-ins with older adults during heat events.

Agencies: Health and Human Services Agency; Department of Public Health | Governor's Office of Planning and Research; California Volunteers | Governor's Office of Emergency Services

Track B - Goal 2: Protect California's workers and economy from the impacts of extreme heat

Established Actions

TRACK B - GOAL 2, E1:

Evaluate the Department of Industrial Relations Division of Occupational Safety and Health's Heat Illness Prevention Standard (Title 8, California Code of Regulations, Section 3395) to determine its effectiveness and whether revisions are necessary.

- The Division of Occupational Safety and Health evaluated and revised its *Heat Illness Prevention Standard* in 2015. The revision included new requirements, specifically surrounding provision of fresh, cool, and free water, and access to shade during all recovery, rest, and meal periods when the temperature exceeds 80 degrees Fahrenheit. This action was called for in the 2013 Report and implementation is complete.

Agencies: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Department of Food and Agriculture | Health and Human Services Agency; Department of Public Health

TRACK B - GOAL 2, E2:

Convey necessary worker protection measures to regulated entities.

- The Division of Occupational Safety and Health's *Heat Health Illness Prevention Network* is a voluntary public/private partnership established to increase both employers' and employees' awareness of the hazard of heat illness and the importance of heat illness prevention measures through the provision of timely and essential information. This action was called for in the 2013 Report and implementation is ongoing.

Agencies: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Department of Food and Agriculture | Health and Human Services Agency; Department of Public Health

TRACK B - GOAL 2, E3:

Support training of employers and workers in industries with outdoor work, including assurance of adequate water, shade, rest breaks, and training on heat risks.

- The Division of Occupational Safety and Health's 2015 *Heat Illness Prevention Standard* update included assurance of adequate water, shade, and rest breaks. This action was called for in the 2013 Report and implementation is complete.
- Additionally, the Division of Occupational Safety and Health has developed and published *a suite of education and training materials, consultation services e-tool, and sample procedures for employers* to accompany the Heat Illness Prevention Standard. This effort focuses on driving prevention through easily accessible information for workers and employers to be coupled with targeted enforcement before and during periods of high risk.

Agencies: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Department of Food and Agriculture

TRACK B - GOAL 2, E4:

Evaluate the effectiveness of engineering and administrative controls to mediate employee exposures to high heat; develop new methods of protection.

- The Division of Occupational Safety and Health provides *consultations* to aid employers in evaluating the effectiveness of engineering and administrative controls, as well as implementing strategies for ensuring employee safety from heat-related illness. This action was called for in the 2013 Report and implementation is ongoing.
- The Division of Occupational Safety and Health is developing a new Indoor Heat Illness Prevention regulation to protect indoor workers from heat illness. Included in the draft regulation are requirements for the employer to implement engineering and administrative controls to prevent heat illness. The *draft regulatory text* requires employers to implement engineering controls in certain environments to lower indoor temperatures.

Agencies: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Department of Food and Agriculture

TRACK B - GOAL 2, E5:

Develop an indoor heat regulation for consideration by the Occupational Safety and Health Standards Board.

- The California Labor Code Section 6720 requires the Division of Occupational Safety and Health to propose an indoor heat regulation to the Standards Board. The Division of Occupational Safety and Health has convened several advisory committee meetings on this topic and

is in the final stages to submit the complete rulemaking package to the Occupational Safety and Health Standards Board. The rule making process is currently underway and formal rulemaking at the Standards Board is expected to commence in 2022.

Agency: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health

TRACK B - GOAL 2, E6:

Evaluate occupational health risks and strategies to reduce those risks.

- The Division of Occupational Safety and Health's *Outdoor Heat Illness Prevention Standard* is based on literature evaluating occupational health risks and strategies for reducing those risks. This action was called for in the 2013 Report and implementation is complete.
- An *Indoor Heat Illness Prevention Standard* is in development and will similarly be based on evaluating occupational health risks and strategies for reducing those risks. This action was called for in the 2013 Report and implementation is ongoing.

Agencies: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Department of Food and Agriculture | Health and Human Services Agency; Department of Public Health

TRACK B -GOAL 2, E7:

Support business continuity during extreme heat events and create economic opportunity through investments in heat adaptation actions.

- The Governor's Office of Business and Economic Development's *Business Investment Services* raises awareness of climate risks in the business community and assists businesses to operate with minimal interruption during and after extreme climate events or emergencies.

Agencies: Governor's Office of Business and Economic Development | Department of Food and Agriculture

Recommended Actions

TRACK B - GOAL 2, R1:

Protect workers from occupational exposure to excessive heat and provide information on occupational protections and available resources.

- This effort calls for partnering with local health departments and community-based organizations working with farmworkers and other outdoor workers, as well as reaching and educating employers with indoor workers in high risk industries, including the informal and service economies, about addressing heat hazards.

Agencies: Health and Human Services Agency; Department of Public Health |

Department of Food and Agriculture | Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health

TRACK B -GOAL 2, R2:

Identify education opportunities and strategic enforcement strategies to protect workers impacted by extreme heat from heat illness and other health & safety and labor law issues.

- Engage in outreach to workers and employers that are vulnerable to extreme heat hazards about heat illness prevention requirements.
- Collaborate with other state enforcement agencies and local partners on strategic enforcement efforts to protect the health & safety and economic well-being of workers impacted by extreme heat.

Agencies: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Health and Human Services Agency; Department of Public Health

TRACK B - GOAL 2, R3:

Conduct targeted enforcement of outdoor workplaces during periods of high heat to ensure compliance with established outdoor worker heat illness prevention regulations, as well as targeted enforcement of existing requirements under the Injury and Illness Prevention Program for indoor heat hazards.

Agency: Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health

TRACK B - GOAL 2, R4:

Following passage of an occupational heat illness prevention standard for indoor work environments (see Goal 2, E5), conduct targeted enforcement and education campaigns.

- Conduct targeted enforcement of indoor workplaces during periods of high heat to ensure compliance with indoor standards and perform outreach and education on the new regulation.
- Create guidelines and methods to help employers comply with indoor heat illness regulation. Recommendations would be based on the findings of the engineering control measure evaluation (see Goal 2, E4) for indoor work environments, and a publication with these recommendations would serve as an awareness material.

Agencies: Labor Workforce and Development Agency; Department of Industrial Relations Division of Occupational Safety and Health | Health and Human Services Agency; Department of Public Health

TRACK B - GOAL 2, R5:

Support grants for industry-based partnerships that strengthen California's resilience to extreme heat.

- Build workforce programs and training infrastructure to meet employer needs and provide promising career pathways for individuals from disadvantaged communities vulnerable to extreme heat.

Agency: Labor and Workforce Development Agency; Workforce Development Board

TRACK B - GOAL 2, R6:

Build resilience through training partnerships and apprenticeships in jobs and careers that address extreme heat.

- Promote or expand existing efforts to address extreme heat (ex. construction, building decarbonization, microgrids, tree trimming, and forest stewardship) and invest in new areas of focus, such as climate-smart Heating Ventilation and Air Conditioning; building weatherization; energy efficiency retrofits; urban forestry; watershed friendly landscaping; climate smart management of schoolyards, parks, and open spaces; etc.

Agency: Labor and Workforce Development Agency; Workforce Development Board

TRACK B - GOAL 2, R7:

The Delta Stewardship Council will work with agricultural networks, farmers, and farmworkers in the Delta to understand what the agricultural community needs to address extreme heat.

- Conduct targeted outreach with agricultural networks, farmers, and farmworkers to understand needs.
- Improve awareness and resources among vulnerable groups, including farmworkers, through appropriate linguistic, accessible outreach.

Agencies: Natural Resources Agency; Delta Stewardship Council | Department of Food and Agriculture

TRACK B - GOAL 2, R8:

Work with California Native American tribes and stakeholders to understand vulnerabilities of fisheries to extreme heat events.

Agency: Natural Resources Agency; Department of Fish and Wildlife, Ocean Protection Council

Track B - Goal 3: Support local planning and response measures to extreme heat events

Established Actions

TRACK B - GOAL 3, E1:

Assess state, regional, and local hazard mitigation plans, heat contingency plans, and other hazard planning documents for potential incorporation and/or refinement of heat impacts according to climate projections. Promote the integration of climate change research into state and local hazard identification and risk assessment planning efforts.

- The *2018 State Hazard Mitigation Plan* integrates climate change considerations throughout the document as climate change, including extreme heat, has the potential to affect the severity, frequency, and location of hazards events. The development of the 2023 State Hazard Mitigation Plan is underway and will continue to integrate climate risks, including extreme heat. This action was called for in the 2013 Report and implementation is complete.
- The Office of Emergency Services continues to support state and local emergency planning efforts through the administration of federal funds, creation of resources such as the 2020 California Adaptation Planning Guide, and its Contingency Plans. This action was called for in the 2013 Report and implementation is ongoing.
- The Office of Emergency Services, in coordination with the Governor's Office of Planning and Research and the Natural Resources Agency, updated the California Adaptation Planning Guide in 2020. The update includes technical guidance on climate adaptation planning; resources on how to integrate climate change into other local hazard plans; and provides example strategies and detailed case studies of successful climate change planning in California. The Adaptation Planning Guide is integrated into the Office of Planning and Research Integrated Climate

Adaptation and Resiliency Program's Adaptation Clearinghouse as an *interactive web application*. This action was called for in the 2013 Report and implementation is ongoing.

- The Office of Emergency Services updated the *Contingency Plan for Excessive Heat Emergencies* (2014). *The Electric Power Disruption Toolkit for Local Government* (2020) supports the *State Emergency Plan* and describes state operations during heat-related emergencies and provides guidance for state, local, and non-governmental institutions in the preparation of heat emergency response plans. The 2022 update for the State Emergency Plan is underway and will continue to integrate climate risks, including extreme heat.

Agencies: Governor's Office of Emergency Services | Governor's Office of Planning and Research; Planning and Policy| Health and Human Services Agency; Department of Public Health | Labor and Workforce Development Agency; Department of Industrial Relations Division of Occupational Safety and Health

TRACK B - GOAL 3, E2:

Maintain and update a comprehensive Adaptation Clearinghouse, including resources to support local, regional, and tribal heat planning activities.

- The *State's Adaptation Clearinghouse* is a comprehensive, searchable database of resources to support local, regional, and statewide climate adaptation planning and decision-making.

Agency: Governor's Office of Planning and Research; Planning and Policy, in partnership with relevant agencies

TRACK B - GOAL 3, E3:

Support the safety and continuity of care for patients/residents and workforce at licensed facilities during heat-related emergencies.

- During a heat-related emergency, the Department of Public Health's Licensing and Certification Program's response activities include advising health care facilities on caring for patients/residents during extreme heat conditions, monitoring of heat-related unusual occurrences reported by health care facilities until resolved, and investigation of patient/resident heat-related complaints.

Agency: Health and Human Services Agency; Department of Public Health

TRACK B - GOAL 3, E4:

Support grants to local, regional, and tribal governments for climate adaptation and resilience planning activities.

- The Integrated Climate Adaptation and Resiliency Program will establish a grant program that supports local, regional, and tribal governments climate adaptation and resilience planning activities, including heat.

Agency: Governor's Office of Planning and Research; Planning and Policy, in partnership with relevant agencies

TRACK B - GOAL 3, E5:

Launch a Extreme Heat and Community Resilience Program to coordinate state efforts and support local and regional heat adaptation efforts.

- The Integrated Climate Adaptation and Resiliency Program will launch this new grant program to provide grants for extreme heat and urban heat island adaptation activities.

Agency: Governor's Office of Planning and Research; Planning and Policy, in partnership with relevant agencies

Recommended Actions

TRACK B - GOAL 3, R1:

Support local jurisdictions and tribes in integrating extreme heat adaptation strategies into Local Coastal Plans.

- Develop guidance for updating local coastal programs, in consultation with California Native American tribes, to increase climate change resilience and sustainability along the coast, including by addressing extreme heat through land use and building measures such as green building design, smart growth and planting trees/landscaping that reduce the impacts, occurrence, and severity of extreme heat events.
- Assist local governments, in consultation with California Native American tribes, in updating local coastal programs and processing permits for climate change resilience and sustainability plans and projects that address extreme heat.
- Support tribal jurisdictions by providing technical assistance and support to integrate extreme heat adaptation strategies into their own planning document.

Agency: Natural Resources Agency; Coastal Commission

TRACK B - GOAL 3, R2:

Support California communities in developing disaster preparedness plans that incorporate extreme heat and are more inclusive of the needs of people experiencing homelessness.

- Distribute best-practice models and toolkits to guide Continuums of Care, county emergency managers, and local government jurisdictions in building capacity to address the needs of the most vulnerable to extreme events, including extreme heat.
- Incorporate additional climate adaptation strategies into *Technical Assistance to Improve the Delivery of Homelessness Programs* provided to

Continuums of Care and local government jurisdictions.

- Assess and document strong local, state, and tribal examples of disaster preparedness and responses to recent emergencies, to develop stronger guidance and expectations regarding services and supports for people experiencing homelessness in disaster preparedness, response, and recovery efforts.
- Support the inclusion of Continuums of Care into local emergency, hazard, and heat contingency planning efforts. Incorporate people experiencing homelessness into planning documents relating to extreme heat events.

Agencies: Business, Consumer Services and Housing Agency; Housing and Community Development | Health and Human Services Agency; Department of Social Services, Department of Public Health | Governor's Office of Emergency Services

TRACK B - GOAL 3, R3:

Work with tribal and local governments, and community-based organizations to bolster protections for unhoused populations during extreme heat events.

- Coordinate with tribal and local governments on Climate Action and Adaptation Plans to incorporate strategies on how to aid unhoused populations during extreme heat events.
- Support training for first responders to help them anticipate the variety of illnesses (not limited to heat illnesses like heat stroke or dehydration) that are associated with excess heat, including mental health and cognitive impacts.
- Work with local governments and local Continuums of Care to support local plans containing provisions for supporting people who are medically vulnerable, including providing access to resilience centers and/or cooling centers in the event of power shutoffs.

Agencies: Environmental Protection Agency; Office of Environmental Health Hazard Assessment | Health and Human Services Agency; Department of Social Services, Department of Public Health, Mental Health Services Oversight and Accountability Commission | Governor's Office of Emergency Services

TRACK B - GOAL 3, R4:

Support the development of local and tribal heat action plans that include a broad suite of actions to reduce the ambient temperature to counteract the Urban Heat Island effect and reduce risks during extreme heat events.

- Develop an Extreme Heat Plan Alignment Guide and other resources that can guide local governments in preparing and updating comprehensive heat action plans, or components of other plans.

Agency: Governor's Office of Planning and Research; Planning and Policy

TRACK B - GOAL 3, R5:

Provide resources to fund local health departments, tribal health programs, and community-based organizations to develop regional Climate Change and Health Resilience Plans.

- Activities that regions may propose to carry out through their Climate Change and Health Resilience Plans include assessing local vulnerability to the health impacts (including extreme heat); completing environmental scans of local climate change planning (including heat planning); and conducting robust community and stakeholder engagement to create and implement plans to address climate and health impacts, including from extreme heat.

Agencies: Health and Human Services Agency; Department of Public Health

TRACK B - GOAL 3, R6:

Work with the Department of Health Care Services, health care systems, and organizations such as the California Health Care Climate Alliance to plan to assure continuity of operations, safety, and health for patients as global heating increases.

Agency: Health and Human Services Agency; Department of Public Health, Emergency Medical Services Authority, Department of Health Care Services, Department of Managed Health Care

TRACK B - GOAL 3, R7:

Support behavioral interventions, including conducting outreach and engagement with hospitals and medical clinics, to improve clinical evaluation protocols for patients experiencing heat-illness and heat stroke.

Agency: Health and Human Services Agency; Emergency Medical Services Authority, Department of Health Care Services, Department of Managed Health Care

TRACK B - GOAL 3, R8:

Convene an interagency state working group that facilitates opportunities for a more coordinated, effective approach to extreme heat through the ICARP Extreme Heat and Community Resilience Program.

- Coordinate periodic inventories of the state's efforts to adapt to extreme heat and update California's Extreme Heat Action Plan as part of the update to the State's Climate Adaptation Strategy.

Agency: Governor's Office of Planning and Research, Planning and Policy, in partnership with relevant agencies

Action Track C:
Increase Resilience of our Built Environment

As temperatures increase, and heatwaves become more frequent and severe, the cascading impacts of extreme heat and infrastructure failings can further exacerbate risks to people, our economy, and the environment. For example, impacts to critical built infrastructure, such as roadways, rail systems, and drinking water, can result in significant impacts on the state's population and economy.

The proposed actions outlined in the Built Environment track are organized around four goals:

1. Protect critical infrastructure,
2. Support heat resilient and cooler communities through relevant regulations and codes,
3. Invest in cool buildings and surfaces, and
4. Utilize science-based frameworks and tools.

Track C - Goal 1: Protect critical infrastructure

Established Actions

TRACK C - GOAL 1, E1:

Protect energy systems from the impacts of extreme heat.

- The Public Utilities Commission is addressing the need to protect energy supplies to essential services across several rulemakings and programmatic activities, including:
  - *Climate Adaptation rulemaking*: Calls for climate vulnerability assessments every three years from California's three large energy utilities.[9] These assessments examine the vulnerability of electric and gas infrastructure and operations to extreme weather, including extreme heat. The vulnerability assessments will focus on disadvantaged communities as well as critical infrastructure when providing plans for potential mitigation efforts.
  - *Microgrid rulemaking*: Initiated by SB 1339 (Stern, 2018) to create a policy framework to facilitate the commercialization of microgrids, can support local resiliency by ensuring the power stays on for critical services, such as cooling centers, even if the larger grid is unable to function due extreme heat or other emergencies. The Microgrid Incentive Program provides $200M for microgrid development in vulnerable and disadvantaged communities in California.
  - Risk-Based Decision-making and Utility General Rate Cases: Previous Public Utilities Commission decisions require utilities to identify risks associated with utility infrastructure, such as an increasing frequency of heatwaves, and to propose investments to mitigate those risks. For example, rising temperatures and an increased frequency of heatwaves may require changes to the type of electrical equipment utilities

9 Southern California Edison will file a vulnerability assessment in 2022, Pacific Gas and Electric in 2024, and San Diego Gas and Electric in 2025.

purchase and install to keep the grid running, or how that equipment is maintained, to maintain an acceptable level of reliability.

Agencies: Natural Resources Agency; Energy Commission | Public Utilities Commission | Health and Human Services Agency; Department of Public Health, Emergency Medical Services Authority

TRACK C - GOAL 1, E2:

Increase energy resilience during extreme heat events.

- The *Joint Agency Root Cause Analysis* (2021) and *Summer 2021 and 2022 Reliability Analysis* (2021) identified potential improvements for grid reliability in extreme heat events, some of which are completed, while others are in process. Examples of these improvements include but are not limited to the following:
  - The Public Utilities Commission opened an emergency procurement proceeding (*R.20-11-003*) to address 2021-2023 grid reliability and has authorized procurement of additional resources to support the electricity grid in the event of continued, higher-than-forecast electricity demand resulting from extreme heat events.
  - The Public Utilities Commission is tracking progress on generation and battery storage projects that are currently under construction in California to address any Commission-related barriers and also to assess the impacts of supply chain and trade issues that are effecting targeted online dates.
  - The Independent System Operator, Public Utilities Commission, and Energy Commission have developed a contingency plan and communication protocols to better coordinate their responses to future grid challenges resulting from extreme heat events.
- In 2021, the Public Utilities Commission's emergency reliability proceeding resulted in increases in "reserve margin" resources, which increased reliability when demand is higher than predicted and/or there are system disruptions. The proceeding also resulted in the *Emergency Load Reduction Program*, a new voluntary program that pays customers who reduce their electricity demand in the event of a grid reliability event. This program provides the state's investor-owned utilities and the Independent System Operator an additional tool to rely on when there is increased demand during extreme heat events that also coincide with electric grid emergencies.
- For summer of 2022 and 2023, this rulemaking authorized the procurement of additional resources. In parallel, the Public Utilities Commission has directed utilities to ensure new community-scale microgrids can make resources available to the grid to avoid outages, as well as authorized several demand-side measures to reduce electricity demand during times of high grid stress. The Public Utilities Commission has prohibited large electric utilities from disconnecting residential customers when temperatures are above 100 degrees based on a 72-hour look-ahead period.

Agencies: Natural Resources Agency; Energy Commission | Public Utilities Commission

TRACK C - GOAL 1, E3:
Support communities seeking to invest in heat-resilient transportation infrastructure.

- Caltrans engages with communities most vulnerable to climate change impacts to support development and implementation of climate-resilient transportation infrastructure projects. The *Sustainable Transportation Planning Grant Program* includes funding eligibility for climate change adaptation plans for transportation facilities or to support studies that advance climate change adaptation efforts. Caltrans will also explore opportunities for heat-resilient infrastructure through the new federal discretionary Healthy Streets Program (Sec. 11406 in the Infrastructure Investment and Jobs Act). Finally, Caltrans is pursuing opportunities to advance heat resilience through Caltrans' investments in bike and pedestrian infrastructure.
- The High-Speed Rail Authority collaborates with communities and stakeholders regarding climate-resilient station area planning. Planning for station site design work includes collaboration with surrounding communities on the use of the station facilities and designs that minimize heat/maximize shading, as well as active transportation access to the station.

Agency: State Transportation Agency; Caltrans, High-Speed Rail Authority

TRACK C - GOAL 1, E4:
Address food system vulnerabilities to extreme heat.

- The Department of Food and Agriculture is working to increase climate smart agriculture practices that improve crops' resilience to extreme heat to ensure California's working lands are as productive as possible and vulnerable communities can access fresh produce given the impacts of heat. This includes investment in healthy refrigeration infrastructure in underserved communities.
- Rendering and hauling capacity is often reduced when it is needed the most, as mortalities rise due to extreme heat. The Department of Food and Agriculture is working to increase capacity for the disposal of livestock and poultry carcasses during extreme heat events.

Agency: Department of Food and Agriculture

Recommended Actions

TRACK C - GOAL 1, R1:
Protect and secure energy infrastructure on state lands.

- Work with sister agencies and utility lessees to identify infrastructure risks and

vulnerabilities to extreme heat events and identify and implement strategies to improve protections and risk.

Agencies: Natural Resources Agency; State Lands Commission, Energy Commission, Coastal Commission | Public Utilities Commission

TRACK C - GOAL 1, R2: Support the development, protection, and security of energy infrastructure on tribal lands.

Agencies: Natural Resources Agency; State Lands Commission, Energy Commission, Coastal Commission | Public Utilities Commission

TRACK C - GOAL 1, R3:
Utilize demand forecasts to prepare energy systems for heat and other weather-related extremes.

- Develop enhanced demand forecasts that consider likelihood of extreme events and consider a wide range of weather patterns in hourly forecasts; improved assessment of supply and demand under various possible conditions and scenarios for near-, mid-, and long-term reliability, and increased collaboration with the Public Utilities Commission and Independent System Operator for contingency planning and assessing potential load flexibility.

Agency: Natural Resources Agency; Energy Commission

TRACK C - GOAL 1, R4:
Identify relevant heat-related risks to the state's fish hatcheries and upgrade facilities accordingly to operate efficiently under extreme heat and drought conditions while protecting vulnerable fish populations; provide support for tribal hatcheries seeking to undertake these actions.

Agency: Natural Resources Agency; Department of Fish and Wildlife

Track C - Goal 1, R5:
Develop alternate methods for the disposal of livestock and poultry carcasses during extreme heat events to avoid overwhelming critical rendering infrastructure.

- When animal and poultry mortality rates increase due to extreme heat, the State's thinly stretched rendering facilities cannot accommodate the additional volume. Alternative methods must be established to safely handle these materials and protect public health.

Agencies: Department of Food and Agriculture | Environmental Protection Agency; Department of Resources Recycling and Recovery, California Air Resources Board, State Water Resources Control Board | Governor's Office of Emergency Services

Track C - Goal 2: Support heat resilient and cooler communities through relevant regulations and codes

Established Actions

TRACK C - GOAL 2, E1:

Review and incorporate changes as appropriate to state and local regulations, industry practices for buildings, and land use and design elements to identify opportunities to accelerate the adoption of cooling strategies for both indoor and outdoor environments.

- To incorporate best practice into revision of residential and commercial building standards and codes, and to ensure thermal comfort and healthful indoor air quality, the 2019 Building Code included new requirements for ventilation and indoor air quality. There are also optional requirements for mechanical ventilation for indoor air quality. This action was called for in the 2013 Report and implementation is complete.
- The Department of Public Health staff plans to collaborate with external partners and state agencies to develop recommendations for how the state building codes could be updated during the 2025 building codes update cycle, and work with the Building Standards Commission and other state administering agencies to ensure climate adaptation and resilience measures are incorporated.
- The Governor's Office of Planning and Research provides technical assistance to local governments to support Senate Bill 379 (Jackson, 2015) implementation, which requires cities and counties to update their safety elements to address climate adaptation and resiliency strategies applicable to their jurisdiction. This action was called for in the 2013 Report and implementation is ongoing.
- The 2013 Report called for an update to the California Green Building Standards Code, Title 24 of the California Code of Regulations (CALGreen) to include measures that mitigate the health risks of extreme heat events

in the built environment by incorporating consideration of health impacts. While heat mitigation strategies have been included as optional "reach codes" in the Building Code, health impact measures have not been listed as requirements, therefore this implementation has not been completed.

Agencies: Government Operations Agency; Building Standards Commission | Natural Resources Agency; Energy Commission | Governor's Office of Planning and Research; Planning and Policy| Environmental Protection Agency; California Air Resources Board | Health and Human Services Agency; Department of Public Health

TRACK C - GOAL 2, E2:

Review and improve access to and use of air conditioning and other indoor cooling strategies, including passive cooling techniques and other alternate methods that are energy efficient, low-cost, and do not rely on high global warming potential refrigerants. Address obstacles to the use of air conditioning and other cooling strategies for vulnerable populations.

- The Department of Public Health collaborated with the Department of Community Services and Development on the implementation of AB 1232, which called for an assessment of the Low-Income Weatherization Program, development of an action plan for ensuring greater collaboration between the program and public health agencies, and promotion of projects that increase health and financial benefits to residents. The weatherization measures provided by Low-Income Weatherization Program can help keep single and multi-family housing cool and safe during extreme heat – including through energy efficient air conditioning, improved insulation and windows, and solar PV. This action was called for in the 2013 Report and implementation is ongoing.
- The Public Utilities Commission is also delivering on this action through:
    - *Extreme Weather Rulemaking*: reinstated Flex Alert funding in 2020 and created targeted marketing for extreme heat events.
    - *Decision D.16-11-022:* directed the three large electric utilities to include funding for cooling centers in their General Rate Cases. These cooling center locations include government-run senior centers, community centers, parks and recreation sites, and public buildings. The funding is approximately $200,000 per year to support 400 cooling centers across the state within the large electric utilities' jurisdictions.
    - The Energy Savings Assistance Program: (*A.19-11-003*): provides no cost weatherization measures to income qualified customers which can provide a tighter home envelope for customers and reduces their air-conditioning costs. This program focuses on providing not only energy savings but considerations for how these upgrades impact health,

comfort, and safety, which has implications for helping households better regulate indoor air temperature during extreme heat.

- The Energy Commission's Research and Development programs fund several active projects that focus on improving building envelope performance in both new constructions and retrofit situations. The envelope improvements could reduce heating and air condition use in homes. The projects build on completed research projects that promote cool surfaces and technologies, focus on reducing actions that increase heat risk and reduce indoor heat exposure, increase load flexible buildings to mitigate extreme heat (EPC-19-043, Advanced Energy-efficient and Fire-resistive Envelope Systems Utilizing Vacuum Insulation for Manufactured Homes. EPC-19-033, Demonstrating Benefits of Highly Insulating Thin-Triple Window Retrofits in California. PIR-18-007, Phase Change Material-Enhanced Insulation for Residential Exterior Wall Retrofits. EPC-19-035, Advancing Energy Efficiency in Manufactured Homes Through High Performance Envelope.

Agencies: Health and Human Services Agency; Department of Public Health | Natural Resources Agency| Public Utilities Commission | Labor Workforce and Development Agency; Department of Industrial Relations Division of Occupational Health and Safety | Governor's Office of Emergency Services | Environmental Protection Agency; California Air Resources Board

TRACK C - GOAL 2, E3:

Support local governments with the integration of extreme heat mitigation actions in general plan and housing element updates.

- The 2020 *Integration Concepts for General Plan Updates or Other Local Planning Activities* outlines concepts for integrating various policy topics and new requirements into General Plan updates, housing element updates, or other local planning updates. This Technical Advisory highlights the importance of extreme heat mitigation for housing in vulnerable communities.

Agencies: Governor's Office of Planning and Research; Planning and Policy | Business, Consumer Services and Housing Agency; Housing and Community Development

TRACK C - GOAL 2, E4:

Support regional sustainable communities' strategies, including the mitigation of urban heat island effect through the *Sustainable Transportation Planning Grants Program*. Extreme heat mitigation planning activities are included in these grants at the discretion of the applicant in their planning efforts, for instance as part of a comprehensive adaptation plan or sustainable mobility plan.

Agency: State Transportation Agency; Caltrans

TRACK C - GOAL 2, E5: Drive residential heat resilience through building code updates.

- The *2019 California Green Building Standards Code* (CALGreen) includes voluntary reach codes for both residential and non-residential projects, including specific pavement options to reduce the heat island effect of sidewalks, patios, driveways, and parking lots. Reach codes can be adopted by local jurisdictions to strengthen their building codes.
- The 2022 Energy Code Update encourages the installation of highly efficient electric heat pumps as a baseline technology. Heat pump heating, ventilation, and air conditioning equipment provide an affordable cooling option that also reduces harmful air pollution associated with gas usage. The 2022 Energy Code Update also expands the solar and battery storage standards to certain building types. Battery storage coupled with solar are an important resilience strategy.

Agencies: Government Operations Agency; Building Standards Commission | Natural Resources Agency; Energy Commission

TRACK C - GOAL 2, E6:
Support indoor living and caretaking facilities for vulnerable populations, such as aging and disabled populations, infants, and children.

- The Department of Social Services Residential Care Facilities for the Elderly Manual of Policies and Procedures mandates that Residential Care Facilities for the Elderly and Continuing Care Retirement Communities have minimum and maximum temperature thresholds and allow residents to adjust temperature.
- The Department of Public Health's Center for Health Care Quality enforces state and federal regulations to keep Skilled Nursing Facilities and other healthcare facilities at a comfortable and safe temperature.
- The Department of Social Services Community Care Licensing Division regulates inspections on childcare facilities licensed by the Division. These facilities must maintain minimum and maximum temperatures in indoor rooms.

Agency: Health and Human Services Agency; Department of Social Services, Department of Public Health

TRACK C - GOAL 2, E7:
Bolster correctional facilities' resilience to extreme heat events.

- The Department of Corrections and Rehabilitation requires that all facilities have a heat plan protocol to help reduce the harm to staff and incarcerated populations from extreme conditions.

Agency: Government Operations Agency; Department of General Services, Department of Corrections and Rehabilitation

Recommended Actions

TRACK C - GOAL 2, R1:

Support climate-smart planning in heat-vulnerable schools.

- Invest in net zero energy and zero carbon sustainability planning in California's K-12 public school districts located in heat-vulnerable communities; facilitate meaningful student involvement through education, data collection and information sharing.
- Provide support and technical assistance for sustainability planning to tribal schools.

Agencies: Government Operations Agency; Department of General Services Division of the State Architect | Department of Education; Board of Education | Natural Resources Agency; Department of Forestry and Fire Protection

TRACK C - GOAL 2, R2:

Consider allowing or requiring HVAC systems to be designed and installed to meet higher design temperatures aligning with projected future temperatures from climate modeling, rather than historic temperatures.

- This would require the Energy Commission to develop increased performance standards in the California Energy Code for extreme heat performance that would require manufacturers to meet the new standards with their equipment. This would result in new buildings that still provide sufficient cooling for public health during extreme heat events.

Agencies: Natural Resources Agency; Energy Commission | Government Operations Agency; Department of General Services, Building Standards Commission

TRACK C - GOAL 2, R3:

Administer and support enforcement of the California Green Building Standards Code.

- Promote building standards that integrate design features such as water efficiency and conservation, air quality, sustainable or cooling materials, and other measures which mitigate the urban heat island effect.
- Work with local building officials to help ensure housing development and construction are compliant with CALGreen to mitigate the health risks of extreme heat events in residential housing.

Agencies: Business, Consumer Services and Housing Agency; Housing and Community Development | Government Operations Agency; Building Standards Commission | Natural Resources Agency; Energy Commission

TRACK C - GOAL 2, R4:

Review and incorporate changes to land use, design elements, and building codes to identify opportunities that accelerate the adoption of cooling strategies.

- Assist local governments in pursuing planning and development standards that significantly contribute to reducing greenhouse gases (such as zoning for high-density housing, infill, transit-oriented development, and transit corridors) and adapting to climate impacts including urban heat island effects.
- Promote energy conservation through Housing Element compliance to ensure local governments include an analysis of opportunities for energy conservation regarding residential development; and incorporate the latest research and strategies into Housing Element review and technical assistance regarding land-use planning for energy conservation; conservation incentives for the building industry and residents; and promoting green-building and energy-efficient standards and practices.
- Ensure local jurisdictions with disadvantaged communities incorporate environmental justice into their housing elements as required by SB 1000.
- Provide outreach and technical assistance to local government jurisdictions seeking to adopt Pro-housing Designation Program policies which implement climate adaptation, hazard mitigation, and land-use efficiency.
- Incorporate climate adaptation and resilience strategies or metrics into the Regional Early Action Planning Grant Program.
- Utilize Cool Color Technology in exterior building finishes. The CALGreen Code has a voluntary code Section A5.106.7.2 Opaque wall areas which if adopted locally would require wall surfaces to have a minimum of Solar Reflectance Index (SRI) 25 (aged). Consider making this mandatory in areas most affected by extreme heat events. This would require manufacturers to meet these standards with their exterior finish systems. This would require work with manufacturers, reference standards organizations and interested parties and stakeholders.
- Further improve building envelope performance to better resist extreme heat and increasing temperatures by increasing insulation value, glazing performance, window shading device performance, and requiring thermal breaks eliminating thermal bridging through building framing, glazing, doors, etc. This would require the Energy Commission to develop increased performance standards in the California Energy Code to require increased insulation values, higher performing glazing and thermal breaks building systems. The Energy Commission would need to work with manufacturers, interested parties and stakeholders.
- Explore opportunities to improve thermal comfort in public spaces through relevant codes and regulations, particularly in heat-vulnerable communities.

Agencies: Business, Consumer Services and Housing Agency; Housing and Community Development | Government Operations Agency; Building Standards Commission, Division of the State Architect | Natural Resources Agency; Coastal Commission | Department of Education; Board of Education

TRACK C - GOAL 2, R5:

Advise partners on opportunities to increase heat resilience in collaborative projects within both the built and natural environment.

Agency: Natural Resources Agency and all relevant Departments, Conservancies, Commissions, and Boards

TRACK C - GOAL 2, R6:

Explore the feasibility of implementing residential air temperature requirements.

Agencies: Business, Consumer Services and Housing Agency; Housing and Community Development | Natural Resources Agency; Energy Commission | Government Operations Agency; Building Standards Commission

TRACK C - GOAL 2, R7:

Develop "Cool Communities" model ordinances that local governments can adopt in their building code to implement residential air temperature requirements and provide related technical assistance to tribal governments.

- If these ordinances were adopted, they would require that newly constructed buildings or alterations of existing buildings requiring building permits include treatments to prevent and reduce heat exposure, such as cool roofs, requirements for air conditioning in top floor living spaces with multiple stories, greening/shade, insulation, low impact development, etc.
- Provide outreach and technical assistance to tribal governments about "Cool Communities" practices and potential criteria for newly constructed buildings and alterations of existing buildings requiring building permits.

Agency: Business, Consumer Services and Housing Agency; Housing and Community Development

TRACK C - GOAL 2, R8:

Support installation of insulation, heat pump HVAC equipment, and facility-level clean backup generation (e.g., microgrid) at designated heat shelter facilities in tribal communities and communities most vulnerable to extreme heat events.

Agencies: Natural Resources Agency; Energy Commission | Public Utilities Commission

TRACK C - GOAL 2, R9:

Explore implementation of indoor and outdoor heat exposure rules for schools.

Agencies: Department of Education; Board of Education | Government Operations Agency; Building Standards Commission | Natural Resources Agency; Energy Commission

Track C - Goal 3: Invest in cool buildings and surfaces

Established Actions

TRACK C - GOAL 3, E1:

Examine and expand the use of cool, porous, or sustainable materials in pavement.

- California has required state buildings to be Leadership in Energy and Environmental Design certified since 2004. This certification requirement discourages state facilities from increasing paved surfaces, including new parking and roadway, and encourages community green space. While Caltrans has not developed a specification for cool, porous, and sustainable pavements, the Department advanced the practices of recycling and sustainability through the expanded usage of porous pavements. The Department has also built two pavements that converted dark pavement to white pavement and is exploring how to utilize cool pavements in urban parking lots. This action was called for in the 2013 Report and implementation is ongoing.
- The California Green Buildings Standards Code includes voluntary code Section A5.106.11.1: hardscape alternatives, that has strategies for site hardscape alternatives and references American Society for Testing and Materials E1918 or C1549. Once Caltrans completes the standard specification for sustainable or cool pavements pursuant to *AB 296 (2012)*, the Building Standards Commission will consider it for adoption in CALGreen. These updates could consider mandating these in areas affected by urban heat islands, including any standard specifications for cool or sustainable pavements developed by Caltrans or the Department of General Services, as well as any other appropriate updates for urban greening, hardscape standards, or cool roofs. This action was called for in the 2013 Report and implementation is not complete.

Agencies: State Transportation Agency; Caltrans | Governor's Office of Planning and Research; Planning and Policy | Government Operations Agency; Department of General Services, Building Standards Commission | Environmental Protection Agency

TRACK C - GOAL 3, E2:
Support communities in expanding energy assurance.

Current energy assurance programs and resources administered by the state include:

- The *Low-Income Weatherization Program* invests in low-income households to provide weatherization services that can protect from extreme heat, and energy efficiency services to enable more affordable and effective cooling (including HVAC, heat pumps, and solar photovoltaic system upgrades).
    - The *Energy Efficiency and Demand Response programs* integrate the energy efficiency and demand response functions of smart thermostats to address summer peak load and keep customers comfortable. Several programs provide incentives for smart thermostats and the Public Utilities Commission is also investigating smart demand response programs in the Extreme Weather rulemaking.
    - The *Self-Generation Incentive Program*, the Disadvantaged Communities – Single-family Solar Homes program, and the *Solar on Multifamily Affordable Housing Program* focus on low-income energy resource distribution. These programs provide incentives for the installation of solar and storage on a variety of low-income housing types.
    - The *Low-Income Home Energy Assistance Program* provides low-income households financial assistance to meet immediate residential heating and/or cooling needs. The program also provides HVAC repair and replacement, and weatherization services that address energy efficiency and health and safety.
    - The *Weatherization Assistance Program* helps reduce energy usage and costs by providing services intended to improve energy efficiency in the homes of eligible low-income households.
    - The *California Conservation Energy Corps Program* provides free energy surveys and retrofits for schools and public agencies, including ventilation and air conditioning.
- The 2013 Report recommended the expansion of the California Local Energy Assurance Planning Program. The implementation of this action has not been completed, as the Program was discontinued.

Agencies: Health and Human Services Agency; Department of Community Services and Development | Natural Resources Agency; Conservation Corps | Public Utilities Commission

Recommended Actions

TRACK C - GOAL 3, R1:

Develop and implement a program to accelerate protection of low-income households in disadvantaged communities across the state that are impacted by extreme heat.

- Provide for the direct installation of new heat pump HVAC equipment and retrofits of existing air-conditioning systems, and complementary efficiency measures where needed, in existing residential single family or multifamily buildings. Work directly with existing local and statewide affordable housing providers, tribal governments and tribal designated housing entities. The direct install approach will facilitate quick program roll-out and the ability to leverage installation infrastructure already in place for a variety of local, regional, and statewide programs.

Agencies: Natural Resources Agency; Energy Commission | Public Utilities Commission | Environmental Protection Agency; California Air Resources Board | Housing and Financing Agency | Health and Human Services Agency; Department of Community Services and Development | Business, Consumer Services and Housing Agency; Housing and Community Development | Government Operations Agency; Building Standards Commission

TRACK C - GOAL 3, R2:

Assess and address the unique outdoor water needs for extreme heat events at institutions such as schools and other community gathering places.

- Support Model Water Efficient Landscape Ordinance implementation. Offer technical assistance support to tribal governments seeking to adopt similar ordinances. The ordinance was created as a model for local agencies to enforce minimum standards in landscape design, construction, and management. It achieves this through specific requirements related to soil, plants, irrigation, stormwater, and non-potable water supplies.

Agencies: Environmental Protection Agency; State Water Resources Control Board | Natural Resources Agency; Department of Water Resources | State Transportation Agency; High-Speed Rail Authority

TRACK C - GOAL 3, R3:

Provide funding for additional heat pump HVAC equipment to low-income Californians as part of the Technology and Equipment for Cool Heating (TECH) Initiative.

- This equipment provides air conditioning in summer and space heating in winter without relying on natural gas.

Agency: Public Utilities Commission

TRACK C - GOAL 3, R4: Provide funding for external awnings, in coordination with the Electric Program Investment Charge and Emerging Technology Programs.

- Awnings can reduce heat impacts at a relatively low cost, reducing indoor air temperatures and facilitating less space cooling. These benefits deliver reduced GHG emissions and peak demand caused by air conditioning load spikes.

Agencies: Natural Resources Agency; Energy Commission | Public Utilities Commission

TRACK C - GOAL 3, R5:
Support Electric Program Investment Charge Research and Development on highly efficient building envelope retrofits.

- These retrofits have the potential to lower peak energy demand during extreme high-heat events while maintaining occupant comfort.

Agency: Natural Resources Agency; Energy Commission

TRACK C - GOAL 3, R6: Streamline the permitting, inspection, and approval processes for the installation of high-efficiency heat pump HVAC equipment across the State.

- This action can be advanced through grants and incentives to local building departments who can speed the approval of permits and inspections for high efficiency heat pump HVAC equipment in existing buildings.

Agencies: Natural Resources Agency; Energy Commission | Public Utilities Commission

TRACK C - GOAL 3, R7:
Support buildings built to Passive House standards.

- Passive House designs can reduce energy consumption in buildings more than 75% beyond current California Building Standards Code and more than 95% beyond existing California building stock. Passive House focuses on high efficiency windows and insulation, as well as the elimination of thermal bridging and other tight building envelope measures. Passive House design is currently estimated to result in buildings that are 7-13% more expensive, but the resulting energy and broader environmental savings far outweigh the costs. Additionally, incentives for more Passive House construction could transform the market and lead to price decreases beyond what is prevalent today.

Agencies: Natural Resources Agency; Energy Commission | Public Utilities Commission

Track C - Goal 4: Utilize science-based frameworks and tools

Established Actions

TRACK C - GOAL 4, E1:

Conduct research to assess life-cycle costs and benefits associated with higher-albedo pavement.

- *Lifecycle and Co-Benefits of Cool Pavements* (2017) was prepared for the California Air Resources Board and the Environmental Protection Agency by the Lawrence Berkeley National Laboratory, University of California Pavement Research Center, University of Southern California, and Thinkstep, Inc. This action was called for in the 2013 Report and implementation is completed.

Agencies: State Transportation Agency; Caltrans | Environmental Protection Agency; California Air Resources Board

TRACK C - GOAL 4, E2:

Provide science-based guidance on cool pavements.

- Caltrans has developed a *Cool Pavements Handbook* and has conducted cool pavement pilot projects (as required by AB 296).

Agency: State Transportation Agency; Caltrans

TRACK C - GOAL 4, E3:

Quantify the impact of increased temperatures on electric grid operation.

- The Public Utilities Commission is developing *synthetic hourly climate data corresponding to 1.5,2, or 3 degree Celsius future for the entire Western Electricity Coordinating Council (WECC) footprint* that can be used to quantify the impact of climate change on the operation of the electric grid. Pilot studies using this approach show the impact of climate change on the operation of electric substation transformers due to extreme heat.

- The Public Utilities Commission is also building an analogous model for the existing historical hydropower assumptions going into the Public Utilities Commission's forecasting to capture the impacts of climate change.

Agency: Public Utilities Commission

TRACK C - GOAL 4, E4:
Quantify the equity and resiliency impacts of electricity infrastructure investments.

- The Public Utilities Commission is developing a regulatory and analytical framework for quantitatively assessing the impacts of alternative electricity infrastructure investments on resiliency and equity outcomes.

Agency: Public Utilities Commission

Recommended Actions

TRACK C - GOAL 4, R1:
Study the impacts of mitigations to the built environment on reducing health effects from high heat in California.

- Examine mitigation measures in the built environment to reduce urban heat islands and heat effects generally such as cool surfaces, nature-based solutions, including planting shade trees and increasing green spaces, as well as weatherization.
- Understand changes in morbidities and mortalities due to heat-related illness, as well as comfort and quality of life indicators; compare areas where mitigations can be found and areas lacking these mitigations. Study the effects of the different mitigations.
- Examine the impacts of different racial/ethnic and disadvantaged contexts in communities and compare the frequency and efficacy of mitigation measures in different communities.
- Examine the impact of urban heat islands on health, comfort, and quality of life indicators, and examine results by race/ethnicity and other relevant demographic indicators such as income.

Agency: Environmental Protection Agency; California Air Resources Board | Health and Human Services Agency; Department of Public Health

TRACK C - GOAL 4, R2:
Provide health data to support adoption of an indoor residential cooling standard.

Agency: Health and Human Services Agency; Department of Public Health

TRACK C - GOAL 4, R3:

Convene a task force to assess effectiveness of built environment interventions, including cool surface technologies.

Agency: Governor's Office of Planning and Research; Planning and Policy, in partnership with relevant agencies

TRACK C - GOAL 4, R4:

In partnership with local and tribal communities, support pilot projects to explore efficacy of built environment and nature-based interventions and to determine which cooling strategies work best given local considerations.

- The Energy Commission's Research and Development programs have several planned research initiatives that focus on energy resiliency and cost-effective building envelope upgrades to existing building and community infrastructure and new construction. The projects build on completed research projects that promote cool surfaces and technologies, focus on reducing actions that increase heat risk and reduce indoor heat exposure, and increase load flexible buildings to mitigate extreme heat.
- Utilize results from the Department of Forestry and Fire Protection's Urban and Community Forestry Program, United States Department of Agriculture Forest Service, and University of California Davis analysis of statewide urban tree canopy cover data to inform high priority areas for investment in related pilot projects and monitoring efforts.

Agency: Natural Resources Agency; Energy Commission, Department of Forestry and Fire Protection

Action Track D: Utilize Nature-based Solutions

When natural systems are healthy and resilient, they provide essential benefits and services to people. Unhealthy landscapes have the opposite effect – they release more greenhouse gases than they store, increase climate risks to people and nature, and are more vulnerable to future climate change impacts.

Extreme heat and increasing temperatures compromise natural systems. California is committed to supporting our natural systems to adapt and promoting the expansion of nature-based climate solutions across the state. Nature-based solutions can also increase resilience to the impacts of extreme heat, cooling communities and providing strategic shade.

"Nature-based solutions" describe actions that work with and enhance nature to help address societal challenges. This term is an umbrella concept used across the world to describe a range of ecosystem-related approaches that protect and restore nature to deliver multiple outcomes, including addressing climate change, protecting public health, increasing equity, and protecting biodiversity.

California Native American tribes are the original stewards of all California lands and waters since time immemorial. Tribal expertise and Traditional Ecological Knowledges are place-based knowledges that have evolved in relationship between the land and tribal communities over the millennia and provide essential science to build climate resilience and contribute to achieving carbon neutrality. Tribal expertise and Traditional Ecological Knowledges are essential scientific components to Nature-Based Solutions and should inform efforts in this space.

The actions in the Nature-based Solutions track are organized around three goals:

1. Promote nature-based solutions to reduce extreme heat risks,
2. Support nature's ability to withstand and adapt to increasing temperatures, and
3. Reduce heat risk to water supply and systems.

Track D - Goal 1: Promote nature-based solutions to reduce extreme heat risks

Established Actions

TRACK D - GOAL 1, E1:

Guide and accelerate nature-based climate solutions to build climate resilience and contribute to achieving carbon neutrality.

- California released a Natural and Working Lands Climate Smart Strategy in Spring 2022. It identifies land management actions that, among other outcomes, help protect tribal and climate-vulnerable communities, improve public health and safety, and expand economic opportunity. Many of these land management strategies reduce risks from extreme heat and build resilience to future temperature increases.

Agencies: Natural Resources Agency | Environmental Protection Agency | Department of Food and Agriculture | Governor's Office of Planning and Research; Planning and Policy, Strategic Growth Council | Governor's Office of Business and Economic Development | State Transportation Agency | Public Utilities Commission | Business, Consumer Services and Housing Agency | Health and Human Services Agency | Government Operations Agency | Labor Workforce and Development Agency | Departments, Conservancies, Boards, and Commissions across agencies

TRACK D – GOAL 1, E2:

Partner with California Native American tribes to implement tribal expertise and Traditional Ecological Knowledges to accelerate tribal nature-based climate solutions that address extreme heat.

- Partnering with California Native American tribes on climate resilience projects and supporting the study and implementation of tribal expertise and Traditional Ecological Knowledges is a core commitment in the Natural and Working Lands Climate Smart Strategy, the Fifth California Climate Change Assessment, and many other California policies and programs.

Agency: Natural Resources Agency and all relevant Departments, Conservancies, Commissions, and Boards.

TRACK D - GOAL 1, E3:

Utilize nature-based solutions as part of cooling strategies in public and private spaces, including through planting trees, expanding greenspace, restoring urban streams, and increasing public awareness of best practices to green urban residential areas.

- The *Urban and Community Forestry Program* works to increase tree canopy and vegetative solutions, and improve their management in communities throughout California. This includes tree establishment care including watering of trees and installation of water efficient irrigation. Projects in disadvantaged communities can be endowed with additional post grant maintenance funds to assist with long term success. The program supports tree planting on both public and private property and allows for up to 20% of project budgets support engagement, education, and outreach. The Department of Forestry and Fire Protection is tasked through Public Resources Code to administer federal and state grants, technical assistance, education, and outreach, and encourage best practices to be applied by local governments and industry practitioners. This action was called for in the 2013 Report and its implementation is ongoing.
- The Department of Forestry and Fire Protection's Regional Urban Foresters serve as primary contacts for urban forestry expertise, information, training, and technical support for California's communities. This action was called for in the 2013 Report and its implementation is ongoing.
- *The Department of Resources Recycling and Recovery's Community Composting for Green Spaces Grant Program* provides funding to support community groups operating small-scale composting programs in green spaces within disadvantaged and low-income communities, and to utilize the compost created to expand or improve publicly accessible green spaces. This action was called for in the 2013 Report and its implementation is ongoing.
- The Wildlife Conservation Board invested $48.5 million in six grants to restore urban streams over the last three years, and the 2021-22 state budget invested $50 million in urban stream restoration. This action was called for in the 2013 Report and its implementation is ongoing.
- The High-Speed Rail Authority provided $2 million in funding for urban tree planting within disadvantaged communities adjacent to the alignment. See the *2021 Sustainability Report* for additional details.

Agencies: Natural Resources Agency; Department of Forestry and Fire Protection, Department of Water Resources, Department of Conservation, Wildlife Conservation Board, Santa Monica Mountains Conservancy, San Gabriel and Lower Los Angeles Rivers Conservancy | Health and Human Services Agency; Department of Public

Health | Environmental Protection Agency; State Water Resources Control Board, Department of Resources Recycling and Recovery | State Transportation Agency; Caltrans, High-Speed Rail Authority

TRACK D - GOAL 1, E4:

Perform high-resolution tree canopy analysis of the state's urban areas.

- This work is ongoing in partnership with University of California Davis and is expected to be released in 2022-2023. This action was called for in the 2013 Report and implementation is ongoing.
- The Department of Forestry and Fire Protection is currently conducting a high-resolution tree canopy analysis of the state.

Agency: Natural Resources Agency; Department of Forestry and Fire Protection

TRACK D - GOAL 1, E5:

Preserve, enhance, increase, and establish community green areas.

- The *Urban Greening Grant Program* funds projects that both establish and enhance parks and open space and create more walkable and bike-able communities.
- A number of Department of Parks and Recreation's programs fund the creation or improvement of recreational space:
- The *Statewide Park Program* creates new parks and recreation opportunities in underserved communities across California.
    - The *Regional Park Program* creates, expands, and improves regional parks and regional park facilities.
    - The *Rural Recreation and Tourism Program* creates new recreation opportunities within rural communities to support health-related and economic goals and increase active-transportation leading to more physical activity and improved health.
    - The *Recreational Infrastructure Revenue Enhancement Program* improves and enhances local or regional park infrastructure.
    - Department of Parks and Recreation's *Per Capita Program* provides grants for local park rehabilitation, creation, and improvement to local governments on a per capita basis.

Agencies: Natural Resources Agency; Department of Parks and Recreation

TRACK D - GOAL 1, E6:

Scale nature-based solutions through transportation projects.

- The *Environmental Enhancement and Mitigation Program* funds environmental enhancement and mitigation projects directly or indirectly related to transportation projects. Project eligibility includes highway landscape and urban forestry, resource lands, and roadside recreation.

Agencies: Natural Resources Agency | State Transportation Agency

Recommended Actions

TRACK D - GOAL 1, R1:
Partner with school districts, youth, and community-based organizations to accelerate school greening projects in tribal and climate vulnerable communities across the state.

Agencies: Natural Resources Agency; Department of Forestry and Fire Protection | Department of Education | Department of Food and Agriculture |Government Operations Agency; Department of General Services. Division of the State Architect

TRACK D - GOAL 1, R2:
Utilize existing tools to strategically reduce risks of extreme heat through nature-based climate solutions, such as the *California Healthy Places Index: Extreme Heat Edition* and the *California Heat Assessment Tool*.

Agencies: All relevant agencies

TRACK D - GOAL 1, R3:
Identify and implement opportunities to advance nature-based solutions, particularly in communities most vulnerable to extreme heat and other climate impacts.

Agencies: All relevant agencies

TRACK D - GOAL 1, R4:
Develop the State Water Resources Control Board's framework for new water efficiency standards, including the increasing of urban tree canopy for Californians, especially in low-income, vulnerable communities.

- Promote climate-appropriate shade tree cover at schools and community gathering places within the 2030 statewide water conservation framework (AB 1668 & SB 606, 2018).

Agency: Environmental Protection Agency; State Water Resources Control Board

TRACK D - GOAL 1, R5:
Promote increased use of green barriers between agricultural fields and residences and schools to increase the area of permeable surfaces and green space, while reducing the potential for offsite movement of pesticides, fertilizers, and dust.

Agencies: Environmental Protection Agency; Department of Pesticide Regulation | Department of Food and Agriculture | Natural Resources Agency | Department of Education

TRACK D - GOAL 1, R6:

Provide shade trees and maintenance information to utility customers in tribal and disadvantaged communities that are vulnerable to extreme heat.

- Provide passive cooling in homes and neighborhoods, delivering improved health outcomes, increased access to greenspace, and reduced air conditioning load. It could be modeled after existing successful efforts, such as SMUD's shade tree program or Los Angeles' City Plants initiative.

Agencies: Natural Resources Agency; Department of Forestry and Fire Protection | Public Utilities Commission

TRACK D – GOAL 1, R7:

Invest in tribal sciences, including Traditional Ecological Knowledges.

- Invest in the study and implementation of tribally lead sciences, research, and practices, including Traditional Ecological Knowledges, delivering on robust tribally informed research and solutions for climate resilience and addressing extreme heat.

Agency: Natural Resources Agency and all relevant Departments, Conservancies, Commissions, and Boards.

Track D - Goal 2: Support nature's ability to withstand and adapt to increasing temperatures

Established Actions

TRACK D - GOAL 2, E1:

Conserve 30% of California's lands and coastal waters by 2030.

- Our 30x30 goal recognizes that we must act now to protect California's biodiversity, address climate change, and achieve a California for All. The Pathways to 30x30 document will be finalized in early 2022. Progress toward achieving this goal will be tracked through the *California Nature Geographic Information System*.

Agency: Natural Resources Agency | Department of Food and Agriculture

TRACK D - GOAL 2, E2:

Promote climate smart agricultural practices that build resilience to extreme heat.

- The *California Healthy Soils Program* incentivizes farmers and ranchers to transition to agricultural management practices that have a multitude of benefits to farms and society. Healthy soils improve resilience to extreme heat by increasing the moisture holding capacity of soils and allowing roots to better penetrate to access that moisture.
- The *Conservation Planning Program* funds development of plans to support climate smart management of agricultural lands in California. Among other outcomes, implementation of these plans will reduce risks of extreme heat and other climate risks to California's food supply and economy.
- The State Water Efficiency and Enhancement Program (SWEEP) provides financial assistance in the form of grants to implement irrigation systems that reduce greenhouse gases and save water on California agricultural operations. Projects installed through the SWEEP allow growers to respond to times of extreme heat and crop stress with precise and efficient irrigations.

Agency: Department of Food and Agriculture

TRACK D - GOAL 2, E3:

Support environmental restoration and conservation efforts that protect natural systems from the impacts of extreme heat.

- Many restoration and conservation programs reduce risks and/or build resilience to increasing temperatures for the benefit of California's unique biodiversity. These include but are not limited to riparian restoration that cools aquatic habitat; climate refugia conservation; investments that result in cooler water temperatures, such as streamflow enhancement and dam removal; controlling stream bank erosion that allows water to warm faster; and more.
- The 2015 State Wildlife Action Plan is a blueprint for conserving ecosystems across the state. The document and associated sector plans identify conservation strategies and actions to address multiple stressors, including the effects of increased temperatures due to climate change.

Agencies: Natural Resources Agency; Department of Forestry and Fire Protection, Department of Parks and Recreation, Department of Fish and Wildlife, Tahoe Conservancy

Recommended Actions

TRACK D - GOAL 2, R1:

Support forest health and mountain meadow restoration projects that retain mountain snowpack and support water storage.

- Mountain snowpack plays a key role in the water cycle, storing water in winter months and releasing it as runoff in spring and summer. Extreme heat will lead to less snow, earlier snow melt, increased evaporation, and potentially warmer surface water, adversely impacting the water available for wildlife, hydropower, irrigation, and drinking water. Extreme heat also results in earlier snowmelt, which accelerates the start of wildfire season and contributes to more extreme wildfire activity.

Agency: Natural Resources Agency; Department of Fish and Wildlife, Wildlife Conservation Board, Sierra Nevada Conservancy, Tahoe Conservancy

TRACK D - GOAL 2, R2:

Support projects that plan for and implement infrastructure improvements at recreational sites to prepare for extreme heat.

- Extreme heat events lead to added pressure on recreational sites in forests and on rivers, lakes, streams, and beaches as people seek places to escape high temperatures. Plan for and implement infrastructure improvements at recreational sites to mitigate impacts from overuse, provide better conditions and improved safety for people visiting these natural places, and protect biodiversity and habitats.

- Identify opportunities to coordinate and collaborate with local jurisdictions and conservancies, community partners, and other organizations on efforts to implement infrastructure improvements at recreational sites.

Agency: Natural Resources Agency; Sierra Nevada Conservancy, Tahoe Conservancy, Department of Fish and Wildlife, Wildlife Conservation Board, Coastal Commission, San Francisco Bay Conservation and Development Commission, State Coastal Conservancy, Department of Parks and Recreation, State Lands Commission

TRACK D - GOAL 2, R3:

Identify opportunities to implement strategies on state lands that support extreme heat preparedness and resiliency.

- Convene an annual meeting with partner agencies and entities to identify strategies on state lands that support extreme heat preparedness and resiliency, then create implementation plan.
- Engage in community outreach and provide educational resources for lessees and trustees about how they can incorporate cooling strategies in their activities, operations, and infrastructure. Encourage lessees and trustees to implement such strategies in their activities, operations, and infrastructure.
- Utilize ongoing research and experiments, such as forest treatments utilized by Demonstration State Forests, to inform management practices.
- Create, evaluate, and adapt lease terms and conditions that require incorporation of cooling strategies into lease activities, operations, and infrastructure.

Agency: Natural Resources Agency; State Lands Commission, Department of Parks and Recreation, Department of Fish and Wildlife, Coastal Commission, Department of Forestry and Fire Protection

TRACK D - GOAL 2, R4:

Promote access to beaches, coastal areas, and inland waterways that can provide refuge from extreme heat events for heat-vulnerable residents.

- A disproportionate number of disadvantaged populations live in inland areas that are more prone to extreme heat. Many indigenous people were forcibly moved away from their ancestral lands on the coast. Access projects could include campgrounds and cabins, trails, parking lots, restrooms, etc. along with efforts to reduce barriers to coastal access, such as shuttles, field trip programs, and reservation programs. Access projects could also include projects to provide tribal members access to their ancestral coastal lands.
- Engage and consult with tribes who may lack access to ancestral coastal territories to identify opportunities to promote access to beaches and coastal areas.

Agency: Natural Resources Agency; Department of Parks and Recreation, State Coastal Conservancy, Coastal Commission, Wildlife Conservation Board, Commission, San Francisco Bay Conservation and Development Commission, State Lands Commission

TRACK D - GOAL 2, R5:

Identify species, habitats, and ecosystems that are critically vulnerable to extreme heat events and areas that may act as refugia, and connectivity between these areas of refuge, to support biodiversity conservation.

- Implement a climate-biodiversity sensor network (weather stations and ecological sensors), to measure and forecast vulnerability; include Department of Fish and Wildlife-owned or -managed lands and facilities in the assessment.
- Expand and accelerate aquatic stressor monitoring and tracking through on-the-ground field surveys, remote imaging (e.g. via drones), and enhanced GIS mapping capabilities.
- Monitor species within intertidal areas, which are vulnerable to extreme heat during low tides. Focus initial monitoring efforts on Marine Protected Areas.

Agency: Natural Resources Agency; Department of Fish and Wildlife

TRACK D - GOAL 2, R6:

Prioritize conservation and restoration of established and potential climate change refugia, considering migration, range shifts, and connectivity to support biodiversity.

Agencies: All relevant agencies

TRACK D - GOAL 2, R7:

Improve understanding of the link between elevated temperature and stream ecology.

Agencies: Environmental Protection Agency; State Water Resources Control Board | Natural Resources Agency; Department of Fish and Wildlife, Wildlife Conservation Board

TRACK D - GOAL 2, R8:

Incorporate guidance in grant guidelines that direct applicants to best available information on how extreme heat might impact and be mitigated for restoration projects.

Agencies: Environmental Protection Agency; State Water Resources Control Board | Natural Resources Agency; Department of Parks and Recreation, Department of Fish and Wildlife

TRACK D - GOAL 2, R9:

Improve understanding of the link between elevated future temperatures and changes to California's carbon stocks.

Agency: Environmental Protection Agency; California Air Resources Board

TRACK D - GOAL 2, R10:

Build resilience of our food system through assessing cropping systems' vulnerability to extreme heat.

- Investigate which crops have seen significant damage in yield levels or quality due to heat waves.
- Assess the potential and likelihood of mitigation through variety selection, crop breeding, equipment, or infrastructure changes.
- Discuss which outreach efforts could enable effective responses.
- Invest in publicly funded research for heat tolerant, drought tolerant, and climate resilient plant varieties that support a resilient food system and food security for all Californians.

Agency: Department of Food and Agriculture

TRACK D - GOAL 2, R11:

Improve management of surface water temperatures to reduce fish mortality and improve watershed and ecosystem health in the Bay-Delta watershed.

- Focus on the Sacramento River and Water Rights Order 90-5 compliance and emphasis on development of robust modeling and data to inform decisions, early and transparent planning, collaborative solutions, and where appropriate, consideration of additional, voluntary options that balance multiple beneficial uses.

Agency: Environmental Protection Agency; State Water Resources Control Board

TRACK D - GOAL 2, R12:

Support small, underserved farmers and urban centers through Integrated Pest Management technical assistance and outreach, as part of California's commitment to advancing sustainable pest management.

- Integrated pest management is an ecosystem-based pest management strategy focused on prevention of pests or their damage through techniques such as biological control and the use of resistant varieties of plants or materials.

Agencies: Department of Food and Agriculture | Environmental Protection Agency; Department of Pesticide Regulation

Track D - Goal 3: Reduce heat risk to water supply and systems

Established Actions

TRACK D - GOAL 3, E1:
Reduce climate risks to drinking water, including increasing temperatures.

- The *Human Right to Water Tool* provides information about the vulnerability of the state's community water systems to potential water outages, and the *California Drinking Water Needs Assessment* identifies small water systems and domestic wells that are failing or at risk of failing to provide access to safe drinking water.
- The Drinking Water Intended Use Plan and Clean Water Intended Use Plan describe the State Water Resources Control Board's plans for implementing the *Drinking Water State Revolving Fund* and *Clean Water State Revolving Fund* programs that finance infrastructure improvements to mitigate drinking water risks, support the human right to water, and protect and improve water quality.

Agency: Environmental Protection Agency; Office of Environmental Health Hazard Assessment, State Water Resources Control Board

TRACK D - GOAL 3, E2:

Support environmental restoration and conservation efforts that protect water supply and quality from the impacts of extreme heat.

- The *State Water Resource Control Board's 2022 Strategic Work Plan* includes consideration for surface water temperature, which plays a key role in reducing fish mortality, improving watershed and ecosystem health, and increasing forest health, which can protect water quality and aquatic habitat.
- The *Wildlife Conservation Board's Stream Flow Enhancement Program* funds projects that enhance flow in streams to support anadromous fish; support special-status, threatened, endangered, or at-risk species; and provide resilience to climate change.

Agencies: Environmental Protection Agency; State Water Resources Control Board | Natural Resources Agency; Tahoe Conservancy, Wildlife Conservation Board

Recommended Actions

TRACK D - GOAL 3, R1:

Promote green urban stormwater infrastructure to maximize groundwater infiltration and storage.

- Groundwater is less vulnerable to extreme heat impacts than surface storage. Green urban stormwater infrastructure can provide cooling along with water quality and groundwater recharge benefits.

Agencies: Environmental Protection Agency; State Water Resources Control Board | Natural Resources Agency; Department of Water Resources

TRACK D - GOAL 3, R2:

Promote sustainable forest health conditions that protect water quality and aquatic habitat, tribal beneficial uses, reduce fire risk, and increase water yields through coordinated forestry planning activities and the development of waste discharge requirements or waivers for private and federal lands forest management activities.

Agency: Environmental Protection Agency; State Water Resources Control Board

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