

# **Emergency Response Plan for Heat Waves California, USA**



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**GPH - GU 5210: Global Health Disaster Preparedness & Response**

**02 May 2023**

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## PREFACE

### Heatwaves in California

One of the deadliest weather-type events in the United States and throughout the world is heatwaves; studies show more people die in extreme weather than in hurricanes, floods, and wildfires combined.<sup>1</sup> While it has been widely believed that human could tolerate up to 35°C wet-bulb temperature (equal to 95°F at 100% humidity or 115°F at 50% humidity), new research<sup>2</sup> found that the actual maximum wet-bulb temperature is sizably lower — about 31°C wet-bulb or **87°F at 100% humidity** — *even for young, healthy subjects*. The temperature for *older populations, who are more vulnerable to heat, is much likely even lower*. Above these maximum temperatures that humans can endure, **humans cannot adequately regulate their body temperature**, thereby potentially leading to heat stroke or death if exposure is prolonged.

Wet-bulb temperature is read by a thermometer with a wet wick over its bulb—it is affected by humidity and air movement. Wet-bulb temperature therefore represents the temperature when the air is saturated and holding as much moisture as it can in the form of water vapor- this is important because when the air is very humid, sweat will not evaporate and therefore it will not be able to cool down the skin. Human tolerance is basically limited to a wet-bulb temperature around 95 degrees Fahrenheit.<sup>3</sup> Afterwards, the human body starts experiencing major health issues when bodies can't lose heat fast enough. When the core of the body overheats it can shut down, starting from enzymes to organs.<sup>3</sup> Every year, heat kills thousands of people around the world, even though we've only hit wet-bulb temperatures a few times.

The issue of excessive heat has become a particularly serious concern in California, which has faced record-breaking heat waves, including the highest record temperature of 127 degrees in September of 2022 at Furnace Creek in Death Valley.<sup>3</sup> Death Valley in California is know no be one of the hottest places on Earth. It holds the record for highest temperature ever recorded with 134 degrees Fahrenheit in 1913.<sup>4</sup> With citizens extensively using air conditioners during heat waves, the power grid has been on the verge of collapse even though 30% of households lack access to air conditioning.<sup>1</sup>

It is predicted that the number of severe heat waves will increase in the future in California and throughout the US as a result of climate change, with high temperatures experienced throughout

the year. Global weather patterns are drastically changing and, in some cases, leading to the creation of heat domes.<sup>5</sup> According to the NOAA MAPP Program “a strong change (or gradient) in ocean temperatures from west to east in the tropical Pacific Ocean during the preceding winter” can lead to the development of heat domes.<sup>5</sup> A heat dome traps hot ocean air like a lid or a cap. Heat domes can hover over multiple states and the trapped warm air can lead to extremely high temperatures. This is one of the greatest threats from climate change, further providing urgency to slowing down the risk of climate change. This is crucial in order to prevent the worst possible consequences of extremely high temperatures, such as the loss of crops, wildlife, and increased risk of wildfires, property damage and, most importantly, loss of life.<sup>1</sup>

### **Health risks of extreme heat**

Extreme heat events pose significant public health risks. According to the CDC, excessive heat can lead to an increased risk of death due to “heat stroke and related conditions, cardiovascular disease, respiratory disease, and cerebrovascular disease”.<sup>13</sup> Heat waves are also associated with increased hospital admissions for cardiovascular, kidney, and respiratory disorders and on extreme heat days, emergency room visits are ten times the typical amount.<sup>2</sup> Those who are especially vulnerable include the elderly, chronically ill, children, pregnant women, and the homeless.<sup>2</sup>

These guidelines for evaluating and managing heat waves are part of the California heat wave annex.

**SIGNATURE PAGE**

All signatures below indicate authentic support for the California Department of Public Health’s heat wave emergency response plan for the state of California, USA.

\_\_\_\_\_  
JACKSON HOUSE  
*Director of the California Strategic Action Plan*

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## **MISSION STATEMENT**

The mission of the California Department of Public Health (CDPH) is to advance the health and well-being of California's diverse people and communities. Environmental health programs are intended to protect the health, safety, and well-being of the public and preserve and improve the quality of the environment.

## **STATEMENT OF PURPOSE**

The purpose of this plan is (1) how to protect themselves against adverse impacts of heat waves, (2) how to identify cooling centers, and (3) how to identify heat-related symptoms and when to seek medical help.

## **AUTHORITIES**

California AB-2238 Extreme heat: statewide extreme heat ranking system:

*On or before January 1, 2025, the Environmental Protection Agency, in coordination with the ICARP, the State Department of Public Health, and the Department of Insurance, shall develop a statewide extreme heat ranking system to be based upon, but not limited to, all of the following:*

- (1) Available meteorological data from government and academic sources,*
- (2) Information and data on health impacts of heat established through best available science or data from past heat and extreme heat events*
- (3) Measures of extreme heat severity, including the severity of the outcome of extreme heat on human health.*
- (4) Locally relevant information.*
- (5) Comments and suggestions obtained from public input received at a minimum of one public workshop, as appropriate.*

California Office of Environmental Health Hazard Assessment (OEHHA) is responsible to protect and enhance the health of Californians and our state's environment through scientific evaluations that inform, support and guide regulatory and other actions.<sup>10</sup>

California Health and Human Services (CalHHS) is responsible for coordinating the administration of state and federal programs for public health, health care services, social

services, public assistance, health planning and licensing, and rehabilitation. These programs touch the lives of millions of California's most needy and vulnerable residents.<sup>9</sup>

AB-1643 Labor and Workforce Development Agency: heat: advisory committee study:

*This bill would require the agency, on or before July 1, 2023, to establish an advisory committee to study and evaluate the effects of heat on California's workers, businesses, and the economy. The bill would require the committee to meet to recommend the scope of a study to the agency. The bill would require the advisory committee, in considering the effects of heat on California's workers, businesses, and the economy, recommend a study that addresses prescribed topics relating to data collection, certain economic losses, injuries and illnesses, and methods of minimizing the effect of heat on workers.*<sup>6</sup>

California Senate Bill 852: "Eligible project" means a project, including a capital project, that is designed and implemented to address climate change mitigation, adaptation, or resilience, including:

*(B) A project that addresses extreme heat or the urban heat island effect, including increasing shade, deploying cool building and surface materials, using cool pavements; constructing, improving, or modifying new or existing facilities; or increasing access to cooling opportunities.*<sup>8</sup>

AB-2420 Perinatal and infant children health: extreme heat:

*This bill would, subject to an appropriation of funds by the Legislature in the annual Budget Act or another statute for this purpose, require the department, in consultation with subject matter experts, to review available literature on adverse effects of extreme heat on perinatal health, develop guidance for safe conditions and health considerations for pregnant individuals and infant children, and provide guidance to the Legislature by submitting a report that includes legislative or policy recommendations on best practices for connecting perinatal patients with the appropriate health and well-being information relating to extreme heat.*<sup>7</sup>

## DEFINITIONS

- *CDPH* - The California Department of Public Health, a California state department overseeing public health statewide.
- *Climate Change* - The change of average climate condition (temperature, rainfall) in a region overtime.
- *Cooling Centers* - Indoor locations offering relief from extreme heat with cool tempered rooms, cold beverages, and calming techniques.
- *Electrical Grid* - An interconnected network that delivers electrical currents from electrical producers to electrical consumers.
- *Emergency Response Plan* - A plan involving mitigation, preparedness, response, and recovery for a potentially harmful event.
- *Energy Blackouts* - also known as power outages. The power to a set location goes out unexpectedly. Can be caused by numerous factors, i.e. natural causes, human error, and system overload.
- *EPA* - The Environmental Protection Agency, created to protect the American people and environment from health risks.
- *Extreme Heat Ranking System* - Statewide system required for California to rank heat waves. The California Environmental Protection Agency requires it to be in effect by January 1, 2025.
- *Federal Emergency Management Agency (FEMA)* - A United States government agency that coordinates the role of the federal government in preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man made.
- *Heat Dome* - Occurs when high-pressure circulation in the atmosphere acts like a dome or cap, trapping heat at the surface and favoring the formation of a heat wave.
- *Heat Health Effects* <sup>13</sup> -
  - a. *Heat Stroke*: High body temperature (103°F or higher), headache, dizziness, nausea, confusion, fast and strong pulse, irritation of skin (hot, red, dry, or damp), losing consciousness
  - b. *Heat Exhaustion*: Heavy sweating, clammy skin (cold or pale), fast and weak pulse, nausea or vomiting, muscle cramps, headache, fainting, dizziness, tiredness



- c. *Heat Cramps*: Muscle pain or spasms, heavy sweating during intense exercise
  - d. *Sunburn*: Painful, red, warm and blistered skin
  - e. *Heat Rash*: Red clusters of blisters on the skin
- *Heat Wave* - Caused by high pressure systems, which form when cool, dense air sinks to the ground. This air becomes warmer as it compresses towards the earth's surface, and the high pressure pushes away clouds, leading to higher temperatures and lower humidity.
  - *Scorching Temperatures* - Very high temperatures, often between 105°F and 120 °F.
  - *WBGT* - Also known as Wet Bulb Globe Temperature, a method to measure the implication of stress by heat when in direct sunlight.

## **COMMUNICATIONS PLAN**

In the State of California, when heat waves are predicted to reach extreme levels, outreach and communication plans are essential in informing and preparing the population. Communication should be shared through multiple channels by the California Department of Public Health, the Governor of California, and city mayors. The California Office of Environmental Health Hazard Assessment (OEHHA), and the California Health and Human Services (CalHHS) can help inform California officials on the impacts of such heat waves, as well as offer preventative measures of the disaster. In addition, there are specific plans for communication to those living with disabilities, based on each disability. Ensuring the safety of our communities is a top priority. The Extreme Heat Ranking System and Emergency Response Plan should be shared with the residents of California as they prepare for extreme weather.

## **MUTUAL AID AGREEMENT**

The California Department of Public Health, in accordance with the California Strategic Action Plan, should collaborate on preventative measures and a mutual aid agreement. The additional agencies, such as the Office of Environmental Health Hazard Assessment (OEHHA) will assess the environmental health hazards.

Immediate supporting agencies are:

Environmental Health Hazard Assessment (OEHHA)

California Health and Human Services (CalHHS)

Federal Emergency Management Agency (FEMA)

California Department of Public Health

California Energy Commission

California Strategic Action Plan

## **PUBLIC HEALTH CONCEPT OF OPERATIONS**

### **Assessing the Needs of Californians with Heatwaves**

Both an immediate response to extreme heat and a long-term emergency plan are needed by the state of California to make residents and infrastructure less vulnerable to heat. To improve resilience to future extreme heat events the state can improve the infrastructure. Construction planners can modify or build heat-tolerant structures with the ability to withstand high temperatures. There should be strategies to reduce stress on electrical systems such as energy efficiency and conservation efforts during heat waves which will help avoid power outages. The United States Environmental Protection Agency (EPA) encourages cool pavements-which absorbs less solar energy, cool/green roofs, and planting vegetation to make the surroundings cooler.<sup>17</sup> Extreme heat events can negatively impact public health and urban systems if these cooling measures are not taken.

Education and awareness is essential to health protective behaviors that will reduce the risk of heat waves. Specific at-risk communities such as the aging population, pregnant women, and low-income families, should be a priority during extreme heat events. Community leaders should communicate potential risk factors and symptoms of excessive heat exposure, such as dizziness, nausea, confusion, muscle cramps. People may not be aware of the recommended response and treatment to heat waves. Nor may they be prepared to implement salt solutions (for them and their families, especially for children, pregnant women, the elderly and the ailing or disabled). There is a need to initiate awareness efforts *before the first heat wave* because that is the deadliest time as people have not yet acclimated to the heat. Furthermore, this will give people the opportunity to consider their own (and their families) personal risk factors for adverse heat impacts on their health.

EPA published an Excessive Heat Events Guidebook.<sup>17</sup> The guidebook suggests urban areas should have formal systems in place to notify the public of heat waves. Potential heat waves should be announced along with their estimated arrival, duration, and severity. Warning systems should include a first-time notification and response program. Other prevention responses can provide community cooling centers, particularly in areas with vulnerable populations and hotlines can be used to alert public health officials to individuals who are at risk or in distress.<sup>17</sup>

## **Matching Available Resources to the Needs**

With the increasing occurrence of heat waves, and their increasing severity, available resources must be adequate to mount an effective response. Mitigation, especially structural mitigations, while much more costly (e.g., reduced use of fossil fuels, cool building, increased use of solar panels including in inner cities, etc.) is the first step in reducing impact of increasing temperature worldwide. Once a heat wave has occurred, the response must be mounted to match the needs of the affected population (including livestock, and the natural environment, etc). California, for example, is coordinating close communications both within local communities, and with state and federal government to develop and allocate adequate resources to assist with community needs in the face of a heat wave. These include back up power supplies since the power grid is always at risk of failure during heatwaves (excessive demand and increased wildfires can lead to failure), implementing cooling shelters, distribution of emergency supplies, such as rehydration fluids and salts, provision of potable water for communities impacted by loss of water (due to power failure) etc. Currently, there are available resources to support infrastructure mitigations, community-level education / awareness, state and local weather forecasting, and in meeting the prevention needs of at-risk populations within the communities.

*Infrastructure:* The Urban Heat Island Effect is an occurrence that is becoming more common due to a significant amount of infrastructure in small areas.<sup>18</sup> Tall buildings, asphalt, and lots of concrete radiate heat, and when enough heat is radiated, a heat island is formed. These heat islands trap heat in urban areas which can be a main cause for heat waves.<sup>18</sup> The Urban Forestry Act California and California ReLeaf are working together to place more trees and greenery in urban areas.<sup>14</sup> Introducing more trees breaks up the infrastructure and heat produced, allowing for more oxygen release and urban disbursement.<sup>14</sup> Additional resources to assist infrastructure in the face of a heat wave are heat risk spatial maps and thermal satellites. Heat risk spatial maps map out an urban area and where heat production is more concentrated. These maps can be used to assist California ReLeaf to adequately plant trees based on heat disbursement.<sup>18</sup> Thermal satellites locate these heat areas as well, but using satellite imagery. These satellite images capture different “heat islands” or capacities at different hours to best show urban area infrastructure heat production and likely heat wave timelines.<sup>18</sup>

*Education / Awareness:* In the midst of a heat wave, it is essential to recognize heat stroke related symptoms and be able to prevent such symptoms from occurring. The Biden Administration has developed [Heat.Gov](#), a website with the main goal of communicating “heat health information.” [Heat Waves HelpLine](#) is another call-in tip line that gives tips and preparation materials to those in need in the midst of a heat wave. The Heat Waves HelpLine is partnered with the Red Cross to help provide direct assistance for those in need based on heat exposure symptoms and responses.<sup>16</sup> The last available education resource for heat waves is from California’s senate representative, Nancy Skinner, who developed the [Nancy Skinner Senate District 9 Communications Website](#). Skinner’s website is similar to Heat.Gov, but offers specific “what - to - do” steps for specific California regions and for black out situations.

*Weather Forecasting:* Currently, [broadcasts of excessive heat event response information](#) are available with the National Weather Service. Heat forecasting tools like the [wet bulb globe temperature](#) indicate the heat stress on a population, predicting heat wave possibilities. Temperature, humidity, wind, and solar radiation are effective indicators of a potential heat wave<sup>5</sup>. Other resources assisting with accurate heat wave weather forecasting information are home security/recording apps like Ring, Arlo, or Simplisafe. Within these apps, “neighborhood” groups involve multiple members of a community.<sup>15</sup> These groups can be messaged within the app by local law enforcement and weather stations to communicate immediate needs or take-shelter memos.<sup>16</sup> These app resources allow for heat wave information to be directly and quickly notified to all members, in the moment and in hand. This is a significant resource to also aid in prevention of heat stroke and timely symptom recognition and treatment.

*Prevention:* At this time, heat wave prevention is still being researched to determine adequate prevention steps. Energy efficient methods assist with limiting heat and energy produced within a heat island at a specific time, resulting in massive heat waves.<sup>15</sup>

Energy efficient methods include:

- Turning off lights when not in active use
- Taking cold showers
- Hanging clothes to dry in place of using a dryer
- Hand washing clothes in place of using a washer

- Adding energy efficient elements to home (sealing ductwork, wrapping water heater, using ceiling fans in place of HVAC), installing solar panels to supplement or replace electrical use
- Run appliances in the evening when it is a cooler temperature

### **Implementing Strategies to Reduce the Health Impacts**

The California Department of Public Health (CDPH) specifies the needs and standards of cooling projects and energy efficiencies in consultation and in accord with the Environmental Protection Agency (EPA). CDPH also cooperates with the California Energy Commission on clean energies. CDPH also cooperates with mobile security app systems and WBGT to strengthen their focus on extreme weathers and ensure that the messages of heat wave warnings could be promptly delivered to people and organizations. CDPH provides clear guidance to the general public through its public messaging on excessive heat risk and steps to prevent adverse health impacts associated with excessive temperatures and humidity.<sup>23</sup>

Additionally, CDPH works with local community health departments, community clinics, healthcare providers throughout the states during heat emergencies to publicize alerts, warnings and treatments available during extreme heat waves<sup>19</sup>, including banning outside work, availability of local cooling shelters for vulnerable populations, and food & utility deliveries. Unhoused people are especially vulnerable to injury and death during heat waves.<sup>20</sup> CDPH works closely with community health centers to ensure that cooling shelters are provided to vulnerable populations during extreme heat conditions. Cooling center usage data is collected as a part of routine epidemiological collection of community surveillance data. At the same time, CDPH would urge people to “Stay Informed and Protect Themselves During Heat Wave”<sup>23</sup>, provide education and real time updates about heat waves to community health departments, and track heat-related illnesses and deaths using data sets that are available at approximately a 6- to 18-month lag time<sup>21</sup>. Syndromic surveillance using data collected from local retail pharmacy chains on purchases of rehydration salts, thermometers, replacement felids, Pedialyte, etc will be conducted to track early warnings of community impacts from excessive heat. Also, CDPH would partner with CDC to provide public education and emergency care of heat-related illnesses including cramps, heat exhaustion and heat strokes, and ensure employers could provide

necessary facilities and emergency treatment to the employees whose working environments are exposed to excessive heat.<sup>22</sup>

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Annex I. Threat and Hazard Identification and Risk Assessment (THIRA)

Heat Waves in California, USA

<p align="center"><b>NATURAL</b> <i>Resulting from acts of nature</i></p>	<p align="center"><b>TECHNOLOGICAL</b> <i>Involves accidents or the failures of systems and structures</i></p>	<p align="center"><b>HUMAN-CAUSED</b> <i>Caused by the intentional actions of an adversary</i></p>
<p><b>Heat domes</b> are created by ever changing weather patterns. Strong and gradient changes in ocean temperatures during winter, creating a heat envelope.</p> <p><b>Wildfires</b> are occurring more due to the heat increase, and increase the heat even more. Due to landscape dryness from heat envelopes, when wildfires start in this region, they are very difficult to put out and exhaust numerous resources.</p>	<p><b>Power grid failures</b> are created due to excessive electrical use, causing pressure on the grid itself. Extreme heat is produced as a result of usage and overall exerted system pressure.</p>	<p><b>The Urban Heat Island Effect</b> resulted from increased cement, asphalt, and building presence within small locations. Dense infrastructure materials and limited total trees per square block lead to increased heat exposure and production. Heat islands refer to the small areas with significant heat production, which increase the risk and likelihood of a heat wave.</p> <p><b>Fossil fuel</b> usage and acquisition increases the global temperature. Contribute to the urban heat island effect within city parameters.</p> <p><b>Climate Change</b> is a direct result of human waste production and hazardous industrialization by humans. This has led to lots of changes in nature and catastrophic events.</p>

Annex II. Drill and Exercises for Heat Waves in California

<b>Training Seminar Title:</b> Mitigation Strategies to Prevent Heat Stroke during a Heat Wave	
<b>Objectives of your Training Seminar (What mitigation strategy are you advocating?)</b>	Inform California residents on the necessary steps to take during a heat wave to decrease heat wave effects and prevent heat stroke. The main goal of the training is to decrease the number of people that experience heat stroke and heat exhaustion during a heat wave while increasing awareness on how to recognize and/or prevent their associated symptoms.
<b>Estimate Length of Training</b>	45 minute sessions via online platform
<b>Target Audience and max size of audience.</b>	Target audiences would be the Californians who are under high exposure to heat and have high risks of heat stroke(outside workers, natural travelers, homeless people, etc.). The max size of audience for every training session would be 30 people per session.
<b>Who would be a good candidate (e.g., structural engineer, health dept. official, first responder?) as Facilitator of this session? Why?</b>	Community health workers would be good candidates for facilitators of this session, as they have enough knowledge/experience about preventing & first aid actions of heat strokes. Additionally, community health workers could make community members aware of the importance of preventing heat stroke, and they are able to pass the real life experiences they had with heat stroke patients to community members in order to make them learn about heat stroke more authentically.

<p><b>What do you want community members to do as a result of their attending this session?</b></p>	<p>We want community members to learn about the reasons why heat stroke could happen, the basic symptoms of heat stroke, and the actions that need to be taken when heat stroke or milder symptoms such as heat cramps happen. Additionally, we want community members to develop awareness of preventing overexposure to heat, and learn about the anti-heat facilities such as cooling centers during extreme weathers.</p>
<p><b>Strategies to increase community uptake of your mitigation</b> (We have lots of useful links for checklists on the Course Home page under the Important Links page.)</p> <p>List the ones you think might be useful (in the appropriate language) or provide a title or two of a list or handout that you think would be good to give out to attendees.</p>	<ol style="list-style-type: none"> <li>1. Share link with participants to CDC created infographic on heat-related deaths</li> <li>2. Distribute an infographic on recognizing heat stroke vs heat exhaustion and quick actions to take</li> <li>3. Share city/county based map on local assistance shelters for heat waves</li> <li>4. Help participants sign up for heat wave alert and heat stroke assistance alert</li> </ol>

Annex III. Short-term Recovery for Heat Waves in California

Table for Emergency Operations Plan - Short-term Strategies

Necessities	Possible Resources	Distribution Strategies
Water	<ul style="list-style-type: none"> <li>-Reroute water sources from nearby towns</li> <li>-Grocery stores offering packs of bottled water for residents</li> </ul>	<ul style="list-style-type: none"> <li>- Distribute water bottles from nearby grocery stores</li> <li>- Share water through firefighters from other cities</li> </ul>
Food	<ul style="list-style-type: none"> <li>-Partnering up with chain grocery stores such as Costco, BJ's, and Whole Foods, and Safeway to provide fruit and vegetables that are 80% water</li> <li>-Partnering up local food stores to donate can goods</li> </ul>	<ul style="list-style-type: none"> <li>-Disaster recovery sites will give boxes of food items to each family to keep their bodies hydrated</li> <li>-Grocery stores will distribute food to community and families in hopes of being self-sufficient</li> </ul>
Housing	<ul style="list-style-type: none"> <li>-Relocation to California's shelters and emergency housing</li> <li>-Community members in nearby neighborhoods opening their homes to victims</li> </ul>	<ul style="list-style-type: none"> <li>-Those who are injured or elderly will be transported by ambulance</li> <li>-Those with children will evacuate first and stay with other families</li> </ul>
Electrical Power & Generators	<ul style="list-style-type: none"> <li>-Partner with local electrical and hardware stores to provide portable generators</li> </ul>	<ul style="list-style-type: none"> <li>-American Red Cross will disperse generators to priority areas that require medical/critical needs</li> </ul>