






**What impact does extreme heat have in California,  
and what can we do about it?**

Extreme Temperatures

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## OVERVIEW

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### Unit Question: What impact does extreme heat have in California, and what can we do about it?

Students learn that heat waves and periods of extreme heat are occurring more frequently in California. Students then investigate how extreme heat affects individuals and their communities and learn about the actions they can take to prepare for and stay safe during extreme heat.

#### While investigating extreme heat, students will

- learn about extreme heat and how it is related to weather and climate.
- investigate the effects of extreme heat and who is at greatest risk during periods of extreme heat.
- investigate actions individuals and communities can take to prepare for extreme heat.
- synthesize their learning to develop an action plan to help their community prepare for extreme heat.

**Unit Home Discipline:** Science

## STANDARDS SUMMARY

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### California Environmental Principles and Concepts

#### → Principle 4—There Are No Permanent or Impermeable Boundaries That Prevent Matter from Flowing Between Systems

The exchange of matter between natural systems and human societies affects the long-term functioning of both.

- **Concept C.** The capacity of natural systems to adjust the human-caused alterations depends on the nature of the system as well as the scope, scale, and the duration of the activity and the nature of its by-products.

### History—Social Science

#### → Content Standard(s)

- HSS-3.1: Students describe the physical and human geography and use maps, tables, graphs, photographs, and charts to organize information about people, places, and environments in a spatial context.
  - HSS-3.1.1: Identify geographical features in their local region (e.g., deserts, mountains, valleys, hills, coastal areas, oceans, lakes).
  - HSS-3.1.2: Trace the ways in which people have used the resources of the local region and modified the physical environment (e.g., a dam constructed upstream changed a river or coastline).

### Science

This lesson builds understanding toward this/these California Next Generation Science Standards Performance Expectation(s):

- **3-ESS3-1:** Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

*This lesson emphasizes these elements of the California Next Generation Science Standards:*

#### → Science and Engineering Practices

- **Asking Questions and Defining Problems:**
  - Ask questions that can be investigated based on patterns such as cause-and-effect relationships.
- **Developing and Using Models:**



- Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
- **Analyzing and Interpreting Data:**
  - Represent data in tables and various graphical displays (bar graphs, pictographs) to reveal patterns that indicate relationships.
- **Engaging in Argument from Evidence:**
  - Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

### → Disciplinary Core Ideas

- **ESS2.D: Weather and Climate:** Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
- **ESS3.B: Natural Hazards:** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

### → Crosscutting Concepts

- **Patterns:**
  - Patterns of change can be used to make predictions.
- **Cause and Effect:**
  - Cause and effect relationships are routinely identified and used to explain change.

### Common Core English Language Arts

- CCSS.ELA-Literacy.RI.3.1: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- CCSS.ELA-Literacy.RI.3.2: Determine the main idea of a text; recount the key details and explain how they support the main idea.
- CCSS.ELA-Literacy.RI.3.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.
- CCSS.ELA-Literacy.RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
- CCSS.ELA-Literacy.RI.3.9: Compare and contrast the most important points and key details presented in two texts on the same topic.
- CCSS.ELA-Literacy.W.3.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- CCSS.ELA-Literacy.W.3.7: Conduct short research projects that build knowledge about a topic.
- CCSS.ELA-Literacy.W.3.8: Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
- CCSS.ELA-Literacy.SL.3.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
- CCSS.ELA-Literacy.SL.3.4: Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

### Common Core Mathematics

- 3.MD.B.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories; solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.



- 3.MD.D.8: Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

### Health Education Content Standards for California Public Schools

- 1.4.P: Identify life-threatening conditions (e.g., heart attacks, asthma attacks, poisoning).
- 1.5.P: Describe how a healthy environment is essential to personal and community health.

## BACKGROUND INFORMATION for TEACHERS

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Heat waves, prolonged periods of unusually high temperatures often accompanied by high humidity, are becoming more frequent and intense due to climate change. These events have significant impacts on human health, safety, and the environment, particularly in regions like California. Vulnerable populations, including the elderly, young children, and those without access to cooling resources, face heightened risks during extreme heat events. Communities are employing various strategies to mitigate the impacts of extreme heat, such as establishing cooling centers, distributing air conditioning units to vulnerable groups, and implementing heat safety plans.

Teachers play a key role in fostering community awareness and helping students explore local responses to extreme heat. Incorporating real-world examples, such as local cooling centers or the development of heat safety plans, can make lessons more relatable and meaningful. Teachers should also emphasize equity in addressing heat-related challenges to deepen students' understanding of the broader social implications. While teaching this unit, it is important to be mindful of socioeconomic factors that can play a role in student health and safety, as lower-income communities may lack the resources needed to effectively cope. Consider the social and emotional implications of these topics as students may have personal experience with the dangerous effects of extreme heat. Prepare to adjust language and/or lesson activities as needed to provide a safe learning environment that addresses the individual needs of students.

Preparing students to take action to reduce the effects of extreme heat is a vital component of this unit. Teachers are encouraged to draw on project-based learning techniques or adapt new strategies outlined in the Teacher Handbook to engage students in meaningful, locally relevant actions. By connecting lessons to real-world examples and emphasizing actionable steps, teachers can empower students to address climate challenges in their communities while fostering hope and resilience.

**STORYLINE**

**Lesson 1:  
 ANCHOR**

*Lesson Question:*

**What is happening with heat waves in California?**

**Session 1 • 30 min**

Students will

- Explore an Anchoring Experience
- Generate an Initial Explanatory Model

**Session 2 • 35 min**

Students will

- Generate an Initial Class Model
- Generate a Driving Question Board
- Navigate

**What students figure out:**

- California is experiencing an increase in extreme temperatures and heat waves.
- Increasing temperatures and heat waves are leading to impacts like school closures and extreme heat warnings.

**Sample Initial Model:**



▲ In **Lesson 1**, we *figure out* that California is experiencing an increase in extreme temperatures and heat waves, leading to impacts like school closures and extreme heat warnings. *This leaves us wondering* why temperatures are increasing, what causes heat waves, and what actions we can take to address the challenges of extreme heat in California as we start **Lesson 2**. ▼

**Lesson 2:**  
**INVESTIGATION**

*Lesson Question:*

**What is extreme heat?**

**Session 1 • 35 min**

Students will

- Navigate
- Gather Information and Evidence

**Session 2 • 30 min**

Students will

- Gather Information and Evidence

**Session 3 • 35 min**

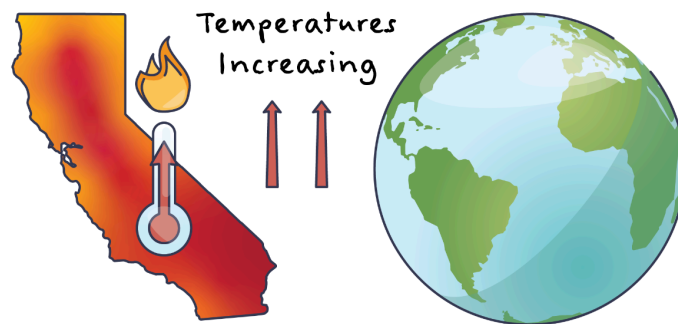
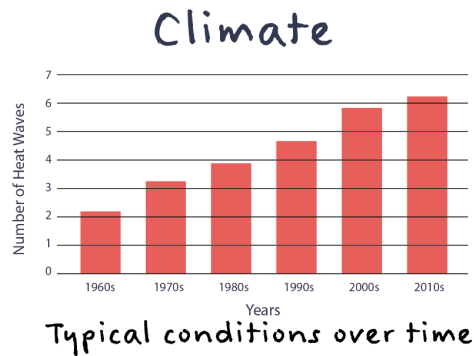
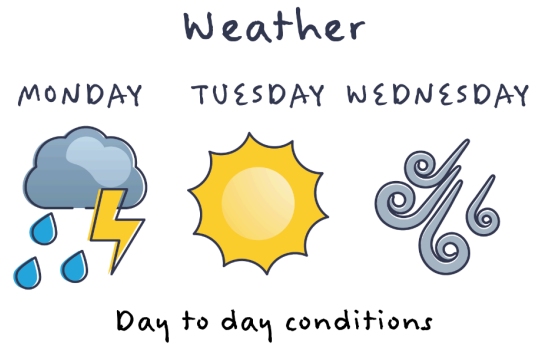
Students will

- Generate an Explanation
- Navigate

**What students figure out:**

- Extreme heat involves prolonged periods of high temperatures and humidity.
- The relationship between extreme heat and weather and climate.

**Sample Model:**



▲ In **Lesson 2**, we *figure out* that extreme heat involves prolonged periods of high temperatures and humidity, and how this phenomenon relates to weather and climate. *This leaves us wondering* how extreme heat affects people, communities, and the environment, and what can be done to stay cool during such events as we start **Lesson 3**. ▼

**Lesson 3:**  
**INVESTIGATION**

*Lesson Question:*

**How does heat affect us and what can we do to stay cool?**

**Session 1 • 35 min**

Students will

- Navigate
- Gather Information and Evidence

**Session 2 • 30 min**

Students will

- Gather Information and Evidence

**Session 3 • 35 min**

Students will

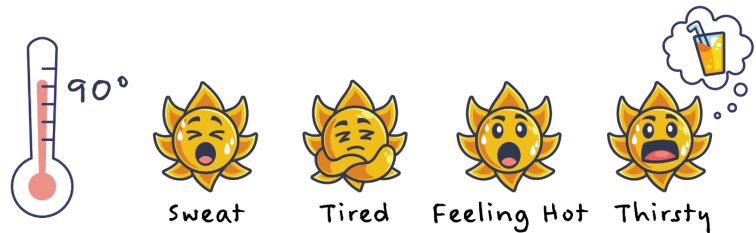
- Generate an Explanation
- Navigate

**What students figure out:**

- Extreme heat makes people feel physically uncomfortable, affects their emotions, and requires specific actions to stay safe and cool.
- Certain groups, like older adults and people without air conditioning, are more vulnerable to extreme heat.

**Sample Model:**

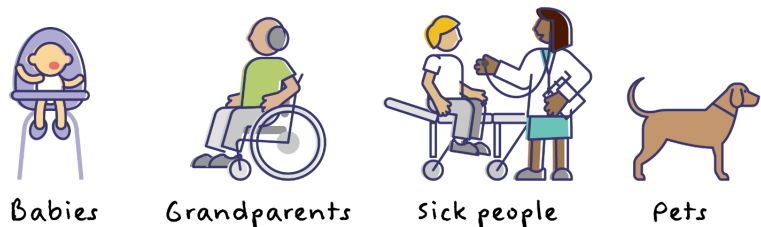
**How Extreme Heat Affects Us**



**How can we stay cool?**



**And Help Others!**



▲ In **Lesson 3**, we *figure out* that extreme heat makes us feel physically uncomfortable, affects our emotions, and requires specific actions to stay safe and cool. We also learn that certain groups, like older adults and people without air conditioning, are more vulnerable to extreme heat. *This will leave us wondering* how communities can work together to help people stay cool and safe during periods of extreme heat as we start **Lesson 4**. ▼

**Lesson 4:**  
**INVESTIGATION**

*Lesson Question:*

**How do communities keep cool?**

**Session 1 • 35 min**

Students will

- Navigate
- Gather Information and Evidence

**Session 2 • 40 min**

Students will

- Gather Information and Evidence
- Generate an Explanation

**Session 3 • 35 min**

Students will

- Generate an Explanation
- Navigate

**What students figure out:**

- The steps communities take to protect people during extreme heat, including the importance of planning and taking specific actions to ensure safety and comfort.

**Sample Model:**



▲ In **Lesson 4**, we *figure out* what communities do to protect people during extreme heat, including the importance of planning and taking specific actions to ensure safety and comfort. *This will leave us wondering* how we can make changes to our environment to keep it cooler and reduce the effects of extreme heat as we start **Lesson 5**. ▼

**Lesson 5:**  
**INVESTIGATION**

*Lesson Question:*

**How can we create a cooler environment?**

**Session 1 • 40 min**

Students will

- Navigate
- Gather Information and Evidence

**Session 2 • 35 min**

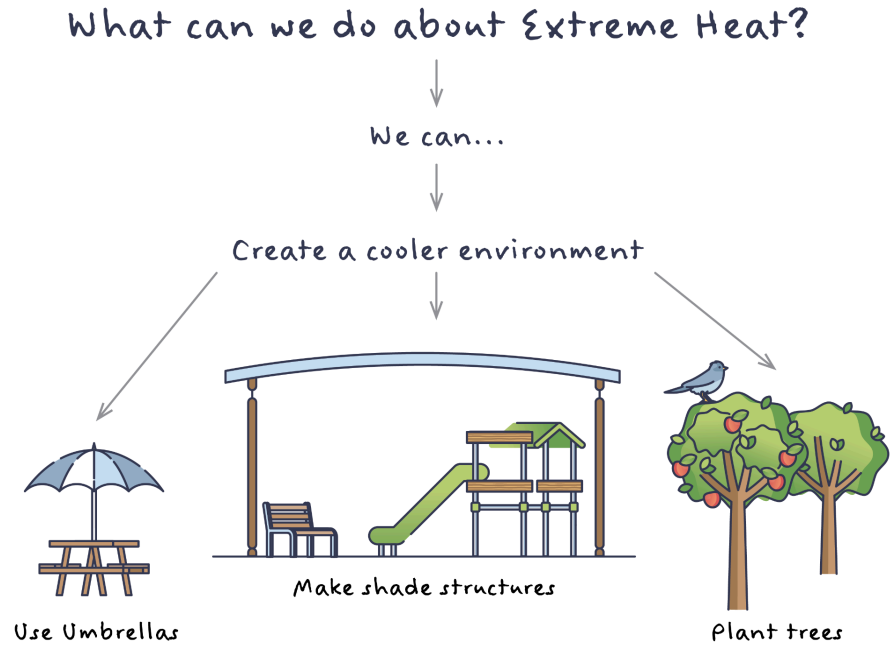
Students will

- Generate an Explanation
- Navigate

**What students figure out:**

- Adding shade, such as trees, umbrellas, and other structures, can significantly lower temperatures and make environments safer during extreme heat.

**Sample Model:**



▲ In **Lesson 5**, we *figure out* that adding shade, such as trees, umbrellas, and other structures, can significantly lower temperatures and make environments safer during extreme heat. *This will leave us wondering* how these solutions can be applied on a larger scale to help entire communities adapt to extreme heat conditions as we start **Lesson 6**. ▼

**Lesson 6:**  
**CONSENSUS MODEL BUILDING**

*Lesson Question:*

**What is happening with heat waves in California?**

**Session 1 • 45 min**

Students will

- Navigate
- Generate a Class Final Explanatory Model

**Session 2 • 45 min**

Students will

- Generate a Class Final Explanatory Model
- Navigate

**What students figure out:**

- Review learning to create a Class Final Explanatory Model that answers the Unit Question.

**Sample Final Model:**



▲ In **Lesson 6**, we *review* our learning to create a Class Final Explanatory Model that answers the Unit Question. *This will leave us wondering* how we might use our new understanding to take action as we start **Lesson 7**. ▼

**Lesson 7:**  
**CULMINATING ENGAGEMENT**

*Lesson Question:*

**How can we help our community prepare for extreme heat?**

**Session 1 • 45 min**

Students will

- Navigate
- Develop an Action Plan

**Session 2 • 45 min**

Students will

- Develop an Action Plan
- Reflect and Connect

**What students plan:**

- A comprehensive action plan to help their community learn about and plan for extreme heat.

**Sample Model:**

There is no model update for this lesson.

▲ In **Lesson 7**, we *use* what we learned throughout the unit to develop a comprehensive action plan to address climate justice. We apply our knowledge of personal, community, and environmental actions to create a plan that can make a real difference in our school and community. We reflect on our learning and consider how we can continue to take action in the future.