California at the Tipping Point

Watch it online http://www.kqed.org/quest/television/climate-watch-california-at-the-tipping-point-part-one
TV story length 22:46 minutes

QUEST SUBJECTS

Life Science
Biology
Health
Environment

Earth Science
Geology
Weather
Astronomy

Physical Science
Physics
Chemistry
Engineering

CA SCIENCE STANDARDS

Grade 6
Ecology (Life Sciences)
5. (e) Number and types of organisms an ecosystem can support depend on the resources available and on abiotic factors.

Grade 7
Evolution
3. (e) Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.

Grades 9-12
Ecology (Biology/Life Sciences)
7. (b) changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species or changes in population size

Earth Sciences
6. (c,d) Earth's climate has changed over time; computer models are used to predict the effects of the increase in greenhouse gases on climate movement of objects.

PROGRAM NOTES

What will the transition to a warmer world look like? Join QUEST for an in-depth look at the environmental changes taking place in California and hear about what the future may hold for our state if the global warming trend continues.

In this segment you'll find…

- reasons why sea levels are rising and how this affects California's intertidal zone and human development in coastal areas.
- information about California's changing snowpack and what these data can tell us.
- how and why scientists are using past climate change data to create projection models for the future.

TOPIC BACKGROUND

In 2008, scientists determined that California's temperatures jumped by more than 2.1 degrees Fahrenheit during the 20th century. What's more, the data showed that human activity has played a significant role in that climate change. California's climate is getting warmer—and it isn't necessarily a good thing.

According to research studies, significant increases in average temperatures in California were seen in more than 54 percent of 330 state weather stations, with the largest temperature increases seen in urban areas like the San Francisco Bay region and the greater Los Angeles area. The slowest area to warm was the Central Valley (although it did warm), while the coastal areas warmed faster and the state's southeastern desert region warmed the fastest of all. Overall, it appears that minimum temperatures are increasing faster than maximum temperatures, which means that our nights are getting hotter and our days are staying warm. Additionally, the warming seems to be fastest in late winter and early spring.

What does all this temperature change mean for California? For starters, declining mountain snowpack and prolonged drought conditions could pose a threat to the state's already limited water supplies. Heat waves are projected to be longer, bringing increased danger from wildfires and heat-related deaths. Rising sea levels due to temperature shifts jeopardize life in coastal areas, both for human communities and the plants and animals that rely on California's intertidal and rich wetland ecosystems. Also, more precipitation is expected to fall as rain rather than snow, thereby increasing the risk of floods. And, as heat increases the formation of smog, California's already poor air quality could get even worse.

Climate change may also profoundly affect the economy in California. Shorter ski seasons and damage to the marine ecosystem mean a reduction in tourism. Water shortages mean issues with the commercial and recreational fishing industry, and higher temperatures will affect crop growth and quality, wreaking havoc on our agricultural industry, to name just a few of the economic issues associated with climate change.

VOCABULARY

Climate
the average course or condition of weather at a place, usually over a period of years as exhibited by temperature, wind velocity and precipitation

Ecosystem
a community of living organisms and its environment

Elevation
the height above the level of the sea

Intertidal Zone
of, relating to or being part of the shoreline area about the low-tide mark

Microclimate – the climate of a small, specific place within an area

Species
a category of biological classification comprising related organisms or populations potentially capable of interbreeding

Snowpack
a seasonal accumulation of slow-melting packed snow

Trend
the general movement over time of a statistically detectable change

PRE-VIEWING

- What do you already know about climate change?
- How do you think global warming will affect California?

VIEWING FOCUS

NOTE: You may choose to watch the television segment twice with your students: once to elicit emotional responses and get an overview of the topic and again to focus on facts and draw out opinions.

- What do recent snowpack measurement trends tell us? Why is early snowmelt a problem?
- What are the tidal pool communities telling us about climate change?
- How are California's coastal redwoods expected to respond to climate change?

For all media see:

- Segment Summary Student Sheet
  http://www.kqed.org/quest/downloads/QUEST_SegSum_StudentSheet.pdf
- Personal Response Student Sheet
  http://www.kqed.org/quest/downloads/QUEST_PersResp_StudentSheet.pdf

QUEST, PBS and NPR LESSON PLANS and RESOURCES

NOTE: Resources from the Teachers' Domain collection require a fast and free registration

Global Warming and the Greenhouse Effect Teachers' Domain
http://www.teachersdomain.org/resource/tdc02.sci.phys.matter.greenhouse/
This video excerpt from **Race to Save the Planet** describes the relationship between human activities and negative changes to our global climate.

Climate Change Teachers' Domain
http://www.teachersdomain.org/resource/ess05.sci.ess.watcyc.climatechange/
This video segment adapted from **NOVA Online** describes the difference between weather and climate and examines groundbreaking data that reveal Earth's climate may be changing much more quickly than previously thought.

Taking the Earth's Temperature Teachers' Domain
http://www.teachersdomain.org/resource/tdc02.sci.life.eco.earthstemp/
Follow groups of climate researchers collecting temperature data from a wide range of locations to learn more about global climate change in this video segment from **NOVA/Frontline.**

Trees Dying in the Western U.S. NPR
http://www.npr.org/templates/story/story.php?storyId=99800034
In this **Talk of the Nation** segment, research ecologist Phillip van Mantgem explains why scientists believe an increase in tree deaths in the forests in western states is linked to climate change.

In-depth: Climate Change and the Marine Environment Ocean Adventures
http://www.pbs.org/kqed/oceanadventures/episodes/treasures/climate/
What risks does climate change pose to marine life and their unique habitats? Read this article to find out.

Discuss the California at the Tipping Point Story on the QUEST Blog QUEST
http://www.kqed.org/quest/blog/2009/04/14/reporters-notes-california-at-the-tipping-point/

VISIT OUR PARTNERS

The Bay Institute
www.bay.org

California Academy of Sciences
www.calacademy.org

Chabot Space and Science Center
www.chabotspace.org

East Bay Regional Park District
www.ebparks.org

Exploratorium
www.exploratorium.edu

Girl Scouts of Northern California
www.girlscoutsbayarea.org

Golden Gate National Parks Conservancy
www.parksconservancy.org

The J. David Gladstone Institutes
www.gladstone.ucsf.edu

Lawrence Berkeley National Laboratory
www.lbl.gov

Lawrence Hall of Science
www.lawrencehallofscience.org

Monterey Bay Aquarium
www.mbayaq.org

Monterey Bay Aquarium Research Institute
www.mbari.org

Oakland Zoo
www.oaklandzoo.org

The Tech Museum of Innovation
www.thetech.org

UC Berkeley Natural History Museums
http://bnhm.berkeley.edu/

U.S. Geological Survey
www.usgs.gov

MORE EDUCATIONAL RESOURCES FOR USING QUEST MULTIMEDIA TO ENHANCE 21st CENTURY SKILLS IN TEACHING AND LEARNING

Why Use Media in Science Education?

www.kqed.org/quest/downloads/QUEST_Why_Media_08-09.pdf

- "As science educators, we know how important critical thinking and new technology skills are in the scientific community…" (read more).

Science Multimedia Analysis

www.kqed.org/quest/downloads/QUEST_Science_Multimedia_Analysis_08-09.pdf

- "By increasing students' awareness of the intersections between media and science, we give them the tools to think like scientists…" (read more).

How to Use Science Media for Teaching and Learning

http://www.kqed.org/quest/downloads/QUEST_Media_Tips_08-09.pdf

- If we consider all forms of media "texts" from which students gather information, we can use similar literacy strategies to engage them in video, audio, blogs and Explorations. Once students have obtained information from multiple media sources, how do they share what they have learned? Through their own media-creation projects, of course!

Using Google Maps to Create Explorations

http://www.kqed.org/quest/files/download/52/QUEST_ExplorationCreation.pdf

- Do you like the science hike Explorations on the **QUEST** site? Use this place-based educational guide for educators and group leaders to create similar science-based maps with youth.

OTHER WAYS TO PARTICIPATE IN QUEST

LOG ON

www.kqed.org/quest

LISTEN

KQED 88.5 FM San Francisco &
89.3 FM Sacramento
Mondays at 6:30am and 8:30am

WATCH

KQED Channel 9
Tuesdays at 7:30pm

Major funding is provided by the National Science Foundation, the Gordon and Betty Moore Foundation, the Richard and Rhoda Goldman Foundation, and The Amgen Foundation. Additional support is provided by the S. D. Bechtel, Jr. Foundation, the William K. Bowes, Jr. Foundation, Ann S. Bowers - The Robert Noyce Trust, the Dirk and Charlene Kabcenell Foundation, and the Vadasz Family Foundation.