

Science on the Spot: Science of Fog Educator Guide



A resource for using QUEST video in the classroom

Watch it online <http://www.kqed.org/quest/television/science-on-the-spot-science-of-fog> 4:59 minutes

QUEST SUBJECTS

Life Science **Biology**
Health
Environment

Earth Science **Geology**
Climate
Weather
Astronomy

Physical Science **Physics**
Chemistry
Engineering

CA SCIENCE STANDARDS

Grade 5

Earth Sciences

3. (c) Water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.

Grade 6

Energy in the Earth System (Focus on Earth Sciences)

4. (e) Differences in pressure, heat, air movement, and humidity result in changes of weather.

Grades 9-12

Ecology (Biology/Life Sciences)

6. (b) Changes in an ecosystem result from changes in climate, human activity, introduction of nonnative species, or changes in population size.

PROGRAM NOTES

Recent studies show that average fog levels along the coast of California have declined in the last 60 years. While this may feel like good news for Bay Area residents craving hotter, drier weather, it may possibly mean big ecological changes for the state. UC Berkeley's Todd Dawson explains how fog forms and how this phenomenon affects California.



In this segment you'll find...

- ⦿ descriptions of advection fog and radiation fog.
- ⦿ statistics on the changing fog levels in California.
- ⦿ examples of how a decrease in fog may affect California's redwood trees and other components of California's ecology.

TOPIC BACKGROUND

Similar to other clouds, fog is water vapor that has condensed into tiny water droplets or ice particles suspended in the atmosphere. However, what separates fog from other clouds is mainly the fact that fog is low-lying. This means that fog always occurs close to the ground. Essentially, it is much like a stratus cloud that has touched the Earth. Also, where the water in regular clouds moves into a specific area through rotating air currents and could technically come from anywhere on the planet, the water in fog typically comes from a local source, such as a nearby marsh or lake—or as in the case of the Bay Area, an ocean.

The tiny droplets of water or ice particles that make up fog are extremely dense. This density separates it from another type of low-lying condensation called mist. Because of its density, fog greatly reduces visibility when it appears. Scientists estimate that fog makes it difficult to see beyond about half of a mile in the distance, whereas even the heaviest mist usually allows a person to see at least a mile in the distance. With such a reduction in visibility, thick fog is often at blame for automobile, airplane, and even ship accidents. Although fog can be a nuisance when you are driving a car or operating other transportation vehicles, it is also an important phenomenon in the natural world. For example, redwood forests in California get between about one-third to one-half of their annual moisture from coastal fog.

Fog begins to form when the temperature of the air has reached its dew point. The dew point is the temperature to which a certain parcel of air must cool in order for the already present water vapor to condense into liquid. The dew point is the point of saturation. When the temperature reaches the dew point, the air is saturated and rain, snow, mist, or fog become likely. When the dew point temperature and the surface air temperature are the same, fog would be the most likely form of precipitation out of all four. As quickly as it forms, fog can also disappear just as rapidly. A phenomenon called "flash fog" occurs when the temperature moves from the dew point to even a few degrees above the dew point in a short amount of time. There are many other types of fog, too. Radiation fog and advection fog are the two most common fog types in California. Advection fog, in particular, is what we see on the coast of California on a regular basis.

VOCABULARY

Advection Fog

a type of fog produced when moist air moves horizontally over cold ground

Condensation

the process by which a gas or vapor changes into a liquid

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

Dew Point

the temperature at which water vapor in the air becomes saturated and condensation starts to form

Fog

water vapor condensed to fine particles in the air that differ from clouds because they are so near to the ground

Radiation Fog

a type of fog produced when air near the ground is cooled to saturation due to contact with the cold ground

Topography

the natural and human-made features of a place or region

PRE-VIEWING

- How would you describe the weather and climate patterns in the Bay Area?
- What do you know about fog?

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 does the term "dew point" mean?
- How does fog affect the Bay Area? What do you think this region would be like if fog occurred less frequently?
- Describe the two types of fog that occur in California. Where do they each occur? What are the differences between the two?
- How might a decline in fog affect the ecology of California?

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

LESSON PLANS and RESOURCES from QUEST, PBS, and NPR

Fog Fluctuations Could Threaten Giant Redwoods NPR

<http://www.npr.org/templates/story/story.php?storyId=123771983>

This February 23, 2010 broadcast from NPR's **Morning Edition** discusses how the noted decline in fog frequency in California may affect California's giant redwood trees.

Is The Planet Facing A Mass Extinction? NPR

<http://www.npr.org/templates/story/story.php?storyId=126831134>

What will happen to plants and animals as the climate changes? How can we help protect them? This May 14, 2010 story from NPR's **Talk of the Nation** discusses how global conservation efforts may need to change as the climate changes.

What's Up With The Weather? PBS

<http://www.pbs.org/wgbh/warming/>

Although most scientists agree that Earth's temperature has risen in the past century, the reasons for this change are not altogether clear. This *NOVA/FRONTLINE* special examines the debate and truths about global warming.

Redwoods at Redwood National Park Teachers' Domain

<http://www.teachersdomain.org/resource/etv08.sci.life.oate.redwood/>

What makes our giant redwoods different from other trees? Learn about the requirements and resilience of California's redwood trees in this video segment from *NatureScene*.

Finding the Dew Point Teachers' Domain

<http://www.teachersdomain.org/resource/ng09.sci.ps.earth.dewpoint/>

Stormy Gale, the weathercaster from *Cyberchase* helps students conduct an experiment to learn how cold air must be before fog is formed.

Discuss the Science of Fog story on the QUEST Blog QUEST

<http://www.kqed.org/quest/blog/2010/07/20/producers-notes-science-of-fog/>

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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.girlscoutsnorcal.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 Multimedia in Science Education?

<http://www.kqed.org/quest/downloads/QUESTWhyMedia.pdf>

- Read about the importance of using multimedia in the 21st century science classroom.

How to Use Science Media for Teaching and Learning

<http://www.kqed.org/quest/downloads/QUESTMediaTips.pdf>

- A collection of tips, activities and handouts to actively engage students with multimedia.

Science Multimedia Analysis

<http://www.kqed.org/quest/downloads/QUESTMediaAnalysis.pdf>

- Give your students the tools to recognize the purposes and messages of science multimedia.

Create Online Science Hikes with Google Maps

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 to create similar science-based maps with youth.

OTHER WAYS TO PARTICIPATE IN QUEST



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