

Landslide Detectives

Watch it online at <http://www.kqed.org/quest/television/view/435>
TV story length 10:42 minutes

QUEST SUBJECTS

Life Science
Biology
Health
Environment

Earth Science
Geology
Weather
Astronomy

Physical Science
Physics
Chemistry
Engineering

CA SCIENCE STANDARDS

Grade 4
Earth Sciences
5. Waves, wind, water and ice shape and reshape Earth's land surface. (a, c)

Grade 6
Earth Sciences
2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. (a, d)

Grades 9-12
Earth Sciences; CA Geology
9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards. (b, d)

PROGRAM NOTES

Homeowners in the uplands surrounding the Bay Area may be surprised to know that their hillside properties lie in a major hazard zone. Massive landslides can destroy a house in seconds! Geologists are studying the warning signs and progress of local landslides to help reduce risks and give people adequate warnings of these looming threats.



In this segment you will find...

- an explanation of “deep-seated” and “shallow” landslides.
- examples of Bay Area neighborhoods that have been hit by landslides.
- a look at how geologists are tracking and monitoring landslides in the Bay Area.

TOPIC BACKGROUND

“Landslide” is a general term for a variety of different kinds of ground movement, but it's usually used to describe a massive movement of weak material as it separates from the underlying stable ground. Things like unexpected rivers of mud, rock falls or large flows of debris are considered landslides. Although they're a major geological hazard, landslides are often overlooked because they typically occur in connection with other natural disasters, such as floods or earthquakes.



No U.S. state or territory is entirely free of the threat of landslides; however, they're most prevalent in the Appalachian Mountains, the Rocky Mountain region, some parts of Alaska and Hawaii and in the coastal and mountain regions of California, Oregon and Washington. Landslides can occur wherever a slope of land has become too steep. While gravity plays a part in their occurrence, earthquakes, heavy rains, water erosion, excess weight from manmade structures, an accumulation of loose rock and mining are often the triggers behind a landslide. Just as there are different triggers, there are also several different categories of landslides. Submarine landslides occur underwater, while a *sturzstrom* is a rare form that happens when a large amount of dry soil and rock moves horizontally rather than vertically. Shallow landslides describe an event when only the top mantle of earth moves, perhaps to a few meters deep. A deep-seated landslide occurs when slide material is mostly located below the roots of local trees, typically more than 10 meters below the topsoil.

Landslides cause an estimated one to two billion dollars in damages and kill between 25 and 50 people a year in the United States alone. They can cause extensive damage to highways and have been known to wreak havoc on structures related to timber harvesting, mining, energy production and general transportation -- not to mention what they can do to a house! As the Bay Area continues to expand and develop new neighborhoods and parks in hillside areas, more and more people are threatened by the possibility of a landslide every year -- and many of them don't even know it. This is true in the Bay Area hills, where the combination of steep slopes, weak rock material and winter rainstorms create an ideal setting for landslides.

Media Enhance Education

Video and audio can be powerful tools for meaningful learning. It all depends on you, the educator. The key to using media effectively is preparation. Make the most of learning opportunities by encouraging students to become active viewers and listeners. Pick and choose from the suggested questions and activities to offer an engaging media experience.

Questioning

Oftentimes, teachers and students become frustrated during a media segment when students can't find the answers to a long list of questions. Provide a limited number of questions or topics for students. This focuses their attention during a media segment, helps to keep them engaged and generally results in higher quality answers. QUEST Ed. has provided a number of options for focus questions ranging from fact based to opinions, as well as "big picture" ideas.

PRE-VIEWING

- What are some natural disasters that occur in the Bay Area?
- What can we do to protect our neighborhoods against natural disasters?
- What typically causes more damage, an earthquake or a landslide?
- Should humans develop and inhabit areas that are prone to landslides?

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.

- Describe the differences between deep-seated and shallow landslides.
- What are some dangers of landslides?
- How do landslides affect people?
- Why is it important that geologists like Professor Bill Dietrich and his team continue to study landslides?
- How should the issue of changing property lines be addressed in landslide-prone areas?

POST-VIEWING – Links to activities mentioned here can be found on the following page.

- **Review** students' answers to the Viewing Focus Questions.
- **Research** landslide-prone Bay Area neighborhoods by looking at USGS landslide maps at <http://pubs.usgs.gov/of/1997/of97-745/>. Discuss some characteristics that may affect landslide potential in these areas.
- **Write** an educational pamphlet for Bay Area residents warning them of the dangers of landslides and offering tips on how they can protect themselves.
- **Make** a pictorial chart diagramming different types of landslides and their triggers.

“The job of a geologist is to read the Earth and tell people the story that we’ve read, to give them the vision of the landscape or the geology around them that otherwise they can’t see because it’s a different language. We see that language and we tell the story that it tells us.”

Professor Bill Dietrich, Ph.D.

LESSON PLANS / ACTIVITIES

Mudpile Mountain USGS

<http://www.sd5.k12.mt.us/glaciereft/geoer3-8.htm>

- A hands-on lesson for grades 4-6 investigates the different landforms created by erosion and landslides.

Landslides Discovery School

<http://school.discovery.com/lessonplans/programs/landslides/>

- This lesson for grades 6-8 shows students how different soil materials create different types of landslides.

WEB SITES

Exploring Earth Hazards: Landslides USGS

http://interactive2.usgs.gov/learningweb/explorer/topic_hazards.htm

- This educational Web site features photos of landslides, fact sheets about landslides and maps of hazard areas.

Landslides and Debris Flows USGS

<http://walrus.wr.usgs.gov/elnino/landslides-sfbay/photos.html>

- This site features fly-by movies and images of ancient landslides in the East Bay Hills and Marin County.

Landslides in British Columbia

<http://www.em.gov.bc.ca/Mining/Geolsurv/Surficial/landslid/default.htm>

- This Web site produced by the government of British Columbia has diagrams and images of different types of slides, as well as information about their causes and how they affect human populations.

ARTICLES / READING

“Telegraph Hill Landslide Forces 120 From Their Homes” (2/28/07)

<http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2007/02/28/SLIDE.TMP>

- This **San Francisco Chronicle** article reports on a February 2007 landslide in San Francisco.

“Landslides Will Continue to Impact U.S.—Tumbling Rocks Cost Dollars and Lives” (6/29/99)

<http://www.sciencedaily.com/releases/1999/06/990629085340.htm>

- This **Science Daily** article details the annual impact of landslides on the United States.

Look for the



indicating resources from QUEST partner organizations

QUEST QUAD

FIELD NOTES



Go outside and ...

- 🔍 Observe your surroundings
 - Do you live in a landslide hazard area?
 - Look for evidence of past landslides or warning signs of a possible future landslide in your neighborhood.
- 🔍 Look at the unusual natural land formations in your area
 - Could landslides or erosion have caused any of them? Research these landforms at the local library or online to see if you're right!

FIELD TRIP



Visit ...

- 🔍 Telegraph Hill in San Francisco's North Beach neighborhood
 - Interview people who witnessed the landslide.
 - Witness the damage a landslide can create.
 - Research the geology of Telegraph Hill.
 - Watch raw video footage of the landslide at <http://cbs5.com/video/?id=21149@kpix.dayport.com>

FIELD RESEARCH



Find out more about...

- 🔍 Recent landslide news
 - Visit http://landslides.usgs.gov/recent/ls_news.php to read about the most recent landslides around the world.
- 🔍 Landslide preparedness
 - Visit http://www.fema.gov/hazard/landslide/ls_before.shtm to learn more about how to protect yourself from a landslide and how to recognize the warning signs of this kind of disaster.

FIELD TEST



Experiment with...

- 🔍 Making a mini-landslide
 - Build a steep hill of loose dirt or rocks in a sandbox or contained area.
 - Use water to create a mini-landslide.
 - Watch how the slide forms and see what it does to obstacles in its path.
- 🔍 Test your landslide knowledge
 - Take the landslide quiz at <http://www.ngdc.noaa.gov/seg/hazard/quiz/jsp/quiz/kq.jsp?htype=Landslides>

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 San Francisco Bay Area
www.girlscoutsbayarea.org

Golden Gate National Parks Conservancy
www.parksconservancy.org

Lawrence Berkeley National Laboratory
www.lbl.gov

Lawrence Hall of Science
www.lawrencehallofscience.org

Oakland Zoo
www.oaklandzoo.org

The Tech Museum of Innovation
www.techmuseum.org

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

OTHER WAYS TO PARTICIPATE IN QUEST



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kqed.org/quest



LISTEN

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



WATCH

**KQED Channel 9
Tuesdays at 7:30pm**

CREDITS

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