



San Andreas Fault Trail Exploration Los Trancos Open Space Preserve



Take the Exploration online <http://www.kqed.org/quest/Exploration/view/2>
Download the "Print and Go" guide http://www.kqed.org/quest/dfiles/quest_print_go_los_trancos.pdf

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)
- Grade 6**
Earth Sciences
1. Plate tectonics accounts for important features of Earth's surface and major geologic events. (d, e, g)
2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. (d)
- Grades 9-12**
Earth Sciences
3. Plate tectonics operating over geologic time has changed the patterns of land, sea and mountains on Earth's surface. (b, c, d)
9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards. (b)

EXPLORATION NOTES

This Educator's Guide is designed to accompany the San Andreas Fault Trail Exploration (link above). QUEST recommends taking the Exploration online in the classroom and then going on a field trip to the site. To plan your trip, please visit www.openspace.org/preserves/pr_los_trancos.asp. Also, print out the "Print and Go" guide for Los Trancos Open Space Preserve (link above). For additional information on earthquakes, please see the "Science" section on the Exploration Web site.

Click on "Launch Exploration" to start the online Exploration. Each number represents a waypoint or stop on the trail. Starting at **1**, click on each number to view the accompanying photo(s) and description(s). The virtual Exploration can be taken as a class or done in pairs. Please see Exploration Focus below for questions and activities that go along with each waypoint. Students can answer the questions on the QUESTions & ACTivities student page. Please note that activities are meant to be carried out at the Exploration site. Activities can be completed in pairs and afterward the whole class can discuss what they learned.

TOPIC BACKGROUND

Earthquakes are natural disasters caused by forces deep in the earth that are continuously changing the earth's surface. A sudden release of the pressure that builds from these forces results in an earthquake, and earth's crust rapidly shakes or rolls.

The earth's lithosphere -- the crust and the rigid, uppermost part of the mantle -- is broken up into seven huge tectonic plates and dozens of smaller ones. These plates are constantly moving, slowly shifting against one another at their boundaries. As the plates move, friction builds and the plates get stuck along the edges of the crust, creating stress. When the stress reaches a certain point, a fault (the edge of a plate or a crack in earth's crust) slips. The released energy moves in seismic waves through the crust and causes the ground to shake -- what we feel as an earthquake.

There are three types of plate boundaries: spreading zones, subduction zones and transform faults. Spreading zones occur when hot, molten rock rises and pushes two plates apart, creating new rock material at the edges. Subduction zones occur where the edge of one plate overlaps the edge of another, pushing the lower plate down onto the mantle, where the edges melt. Transform faults occur where two plates slide past one another horizontally, creating friction and tension at the edges.

There are two tectonic plates in California: the Pacific Plate and the North American Plate. The Pacific Plate primarily makes up the floor of the Pacific Ocean and the coastal part of California. The North American Plate is made up of most of the North American continent and a portion of the Atlantic Ocean floor. The plates move very slowly. The Pacific Plate slides northwest past the North American Plate at about two inches per year. At a total length of more than 650 miles and a depth of 10 miles in some areas, the San Andreas Fault (a transform fault) is the primary boundary between the North American and Pacific Plates. The San Andreas Fault zone also includes other smaller boundaries, such as the Hayward Fault in Northern California and the San Jacinto Fault in Southern California.

QUEST Media Connections

Create Your Own Exploration!

Follow these simple steps to design an Exploration with your students in your schoolyard or local park.

1. Choose up to 10 interesting sites around your schoolyard or in a local park to research and photograph. Consider selecting a theme or subject that unites them.
2. In groups, write captions for each photo, making sure to include interesting information.
3. Upload your photos to the Internet through Flickr or another photo site.
www.flickr.com/
4. Follow the simple instructions on Google Maps to design your own Exploration using placemarks, lines and shapes (you'll have to open a free Google account first).
<http://maps.google.com/help/maps/mymaps/create.html>
5. You can also browse through the featured maps to get ideas for your Exploration.
6. Send other classes on your Exploration!
7. For older students, consider exploring Google Earth:
<http://earth.google.com/>

PRE-EXPLORATION

- What is an earthquake?
- Have you ever felt an earthquake? If so, what was it like?
- What is the relationship between plate tectonics and earthquakes?
- How is a fault formed?

EXPLORATION FOCUS

Waypoint 1a: What do you think happens when the Pacific Plate and the North American Plate come together?

Waypoint 2a: What might happen if a strong earthquake occurred near the Crystal Springs Reservoir?

ACTIVITY Waypoint 2b: Examine the features of this sag pond. Can you find the other sag pond near the parking lot?

Waypoint 3a: How might weather and erosion work to fill in benches?

ACTIVITY Waypoint 3b: Keep an eye out for another bench along the trail.

Waypoint 3c: Can you think of any other ridges caused by earthquakes?

ACTIVITY Waypoint 4a: Discuss what you know about past earthquakes in the Bay Area.

Waypoint 5a: What other faults are there in California? How might they be different than the San Andreas Fault?

ACTIVITY Waypoint 6a: Look for places where water might flow. How do earthquakes help create marshes?

Waypoint 6b: How do earthquakes affect your life?

ACTIVITY Waypoint 7a: Can you find any other trees that may have been affected by the 1906 earthquake?

Waypoint 8a: What did you learn about earthquakes by going on this Exploration?

POST-EXPLORATION

- **View** QUEST's TV story "Earthquakes: Breaking New Ground" at <http://www.kqed.org/quest/television/view/570>
- **Use** the Educator Guide developed for the story above at http://www.kqed.org/quest/dfiles/118b_earthquakesbreakingnewground.pdf
- **Read** online about how earthquakes shape the Bay Area at http://www.baynature.com/v06n02/v06n02s_main.html

“Los Trancos Open Space Preserve is a 274-acre area located in the Santa Cruz Mountains above Palo Alto. This is an ideal spot to learn about earthquake geology.” – Midpeninsula Regional Open Space District

LESSON PLANS / ACTIVITIES



Faultline: Seismic Science at the Epicenter The Exploratorium

<http://www.exploratorium.edu/faultline/index.html>

- This Web site has a collection of information, images and activities about earthquakes and plate tectonics.



Earthquake Topics — Lessons Online USGS

<http://earthquake.usgs.gov/learning/topics/index.php?topicID=56&topic=Lessons+online>

- This site has a comprehensive selection of earthquake-related lesson plans and activities.

WEB SITES

The Restless Planet — Earthquakes PBS Online

<http://www.pbs.org/wnet/savageearth/earthquakes/>

- This companion Web site to the **Savage Earth** series features a main article, sidebar information and animated graphics about earthquakes and plate tectonics.



Earthquakes for Kids USGS

<http://earthquake.usgs.gov/learning/kids/>

- This educational site features games, puzzles, pictures, activities and information about earthquakes.

Earthquake! National Geographic

<http://www.nationalgeographic.com/ngkids/0403/>

- This interactive **National Geographic Kids** Web site has stories about earthquakes, as well as maps and information about where and how earthquakes occur.



Maps of Recent Earthquake Activity: SF Bay Area USGS

http://quake.wr.usgs.gov/recenteqs/FaultMaps/San_Francisco.htm

- This site shows earthquakes that have occurred within the last week, day and hour.

ARTICLES / READING

“**San Andreas ‘Fully Loaded’ for Major Quake**” (6/21/06)

http://www.livescience.com/environment/060621_san_andreas.html

- **LiveScience** article discusses the potential for a major earthquake along the San Andreas Fault.

“**The San Andreas Fault**” (6/24/97)

<http://pubs.usgs.gov/gip/earthq3/>





- **USGS** article provides a brief overview of the San Andreas Fault.

Look for the



indicating resources from QUEST partner organizations

QUEST QUAD

FIELD TRIP 	FIELD NOTES 
<p>Before the field trip...</p> <ul style="list-style-type: none">• Print out the “San Andreas Fault Trail – A Self-Guided Earthquake Tour” from www.openspace.org/preserves/pr_los_trancos.asp and take it on the field trip (for older students).• Bring binoculars and bird books and take a break from geology to check out the birds.• Research the history of Los Trancos Open Space Preserve.	<p>While on the trail...</p> <ul style="list-style-type: none">• Take photos to share with the school and/or QUEST community.• Stop and draw earthquake formations.• Eat lunch on an earthquake-formed bench.• Write in a nature journal while relaxing in a special spot.
FIELD RESEARCH 	FIELD TRIP 
<p>Find out more about...</p> <ul style="list-style-type: none">• How earthquakes have shaped the land, including benches and pressure ridges.• The animals and plants that live in Los Trancos Open Space Preserve.• How you can prepare for a major earthquake.• Other fault lines in the Bay Area.• The Ring of Fire.	<p>After the trip...</p> <ul style="list-style-type: none">• Join the QUEST Flickr group and share photos at http://www.kqed.org/quest/photo• Comment on the existing Exploration photos.• Read and comment on geology-related posts on the QUEST blog at http://www.kqed.org/quest/blog/category/geology/• Enhance or share the field trip using Google Maps at http://maps.google.com/help/maps/mymaps/create.html• Design a class Exploration of the schoolyard or local park (see the QUEST Media Connections box).• Explore other open spaces at http://www.openspace.org/preserves/



QUESTions & ACTivities

At each of the San Andreas Fault Trail Exploration waypoints, answer the question or try out the activity.

Waypoint 1a: What do you think happens when the Pacific Plate and the North American Plate come together?

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ACTIVITY Waypoint 6a: Look for places where water might flow. How do earthquakes help create marshes?

Waypoint 6b: How do earthquakes affect your life?

ACTIVITY Waypoint 7a: Can you find any other trees that may have been affected by the 1906 earthquake?

Waypoint 8a: What did you learn about earthquakes through going on this Exploration?

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

OTHER WAYS TO PARTICIPATE IN QUEST



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**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**