






Earthquakes and Ecosystems

Overview:


Students will learn why earthquakes happen in California and about their potential impact on ecosystems.

Objectives:





At the end of the lesson, students will be able to:





-  **Explain** why earthquakes happen in certain areas.
-  **List** three ways that earthquakes can impact ecosystems.
-  **Explain** some major changes that have occurred on the planet due to earthquakes.

Preparation:

 Prior to the lesson, construct a small tectonic plate simulation. Cut a small plastic planting tray in half. Punch two holes in the tray, one on each half of the tray, on opposite sides. Tie a long string through each hole. Arrange the two halves next to each other on a flat surface, as if it had never been cut and fill with loose soil. Plant several seedlings along the middle of the tray. When the two string are pulled, they will cause the two halves of the tray to move crashing together or apart, simulating what happens to vegetation and other things when tectonic plates shift during an earthquake.









Vocabulary:

 earthquake
 fault
 tsunami
 landslide



 tectonic plate
 liquefaction
 ecosystem
 geology

 landmass
 San Andreas Fault
 tree canopy


Materials:

-  Enlarged map of the world's tectonic plates/faults
-  Enlarged map of California with the San Andreas Fault clearly marked
-  Handout: "Earthquakes and Ecosystems"
-  Shoe box or planting tray
-  Scissors
-  Soil
-  String
-  Seedlings

On the Board:

-  Vocabulary
-  Student Reflection Questions

Suggested Snack:

-  There is no suggested snack for this lesson. See our Healthy Snack Database for ideas.

Learning Activities:

1. Review what students have learned previously about earthquakes. (10 min.)
 - A. Ask students to define:
 - *earthquakes*: movements, shaking of the ground that happen when blocks of rock in the earth's crust move suddenly and release energy
 - *tectonic plates*: sub-layers of the earth's crust that move, float, and sometimes fracture (This can cause continental drift, earthquakes, and the formation of volcanoes, mountains, and oceanic trenches.)
 - *fault*: a break in the Earth's crust along which layers of rock slide relative to one another (Most earthquakes occur along faults, or areas where tectonic plates rub against each other.)
 - B. Distribute the handout: "Earthquakes and Ecosystems."
 - Have students examine the map of the world's tectonic plates/faults.
 - Have students identify California and the San Andreas Fault on the map.
2. Presentation: How do Earthquakes Impact Ecosystems? (20 min.)
 - A. Tell students that we usually think about how earthquakes impact humans. But what impacts do earthquakes have on other natural habitats, land forms, and ecosystems?
 - B. Tell students to use the handout to write four hypotheses before the following information is presented, then ask them to add details as they take notes on the information you read aloud.
 - In a *forest*, an earthquake may knock down trees. When this happens it allows more sunlight to penetrate where the tree canopies were that allowed certain kinds of plants and animals to live. So with less canopies, certain plants and animals may die.
 - If a portion of the *coastline* breaks away from the mainland during an earthquake it will take all the plants and animals along with it. Over time the habitat will change in subtle ways, which will necessitate adaptation of the flora and fauna. *Tsunamis* can also occur after an earthquake, and this could cause major flooding of coastal ecosystems, which can kill or displace animals. A *tsunami* can also kill plants, creating a ripple effect on the animal species that benefit from these plants and without them can no longer survive.
 - Earthquakes can also bring *landmasses* together, which can have serious consequences. For example, the Indian subcontinent slammed into the Asian continent millions of years ago due to an earthquake. When this happened plants and animals were immediately forced to compete with many new species from a different subcontinent. Over time the dominant species overwhelm the subordinate species, until an equilibrium is reached.

- The deep-penetrating seismic waves of an earthquake can unsettle *mountainous regions*, leading to catastrophic landslides that may disturb the surrounding ecosystem for many years.
 - The 2011 earthquake in Japan had far-reaching environmental impacts on people, animals, and the surrounding ecosystems. There was a nuclear reactor there that was destroyed. The radioactive fallout from that earthquake resulted in a lack of safe drinking water for humans and animals for miles around the site of the quake.
3. Garden Demonstration: Earthquake Simulation (15 min.)
 - A. Have students gather around the tectonic plate simulation and ask two student volunteers to pull the two strings attached to the simulation in opposite or the same direction simulating tectonic plate movement.
 - B. Have students observe what happened to the plants in the tray as the soil was pulled in these directions.
 - C. Afterwards, students can replant the seedlings/flowers into new pots.
 - D. Have students reflect on the delicate balance of their garden ecosystem. What might happen if the trees were knocked down, or the garden were flooded, or if birds, bees or butterflies were driven away from the space?
 4. Snack (5 min.)
 5. Have students answer the Reflection Questions in their garden journals. (5 min.)

Student Reflection Questions:

1. What do you think might happen in your school garden if there were an earthquake nearby?
2. If a tsunami hit the Southern California coast do you think it might affect you? How?

Assessment Questions:

1. What geologic phenomenon causes an earthquake?
 - **Sub-layers of the earth's crust, known as tectonic plates, move, float, and sometimes fracture or slide against one another.**
2. Can earthquakes be prevented?
 - **No.**

Standards:

Next Generation Science Standards

NGSS-DCI-Disciplinary Core Idea

- MS-ESS2-2.

Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Common Core State Standards

ELA/Literacy

- RST.6-8.1

Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2)

- WHST.6-8.2

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2)

- SL.8.5

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-2)

Acknowledgements:

“Whose Fault is an Earthquake?” Wonderopolis.

<http://wonderopolis.org/wonder/whose-fault-is-an-earthquake>

“Earthquake hits Laptev Sea.” Arctic News.

http://arctic-news.blogspot.com/2013_09_01_archive.html



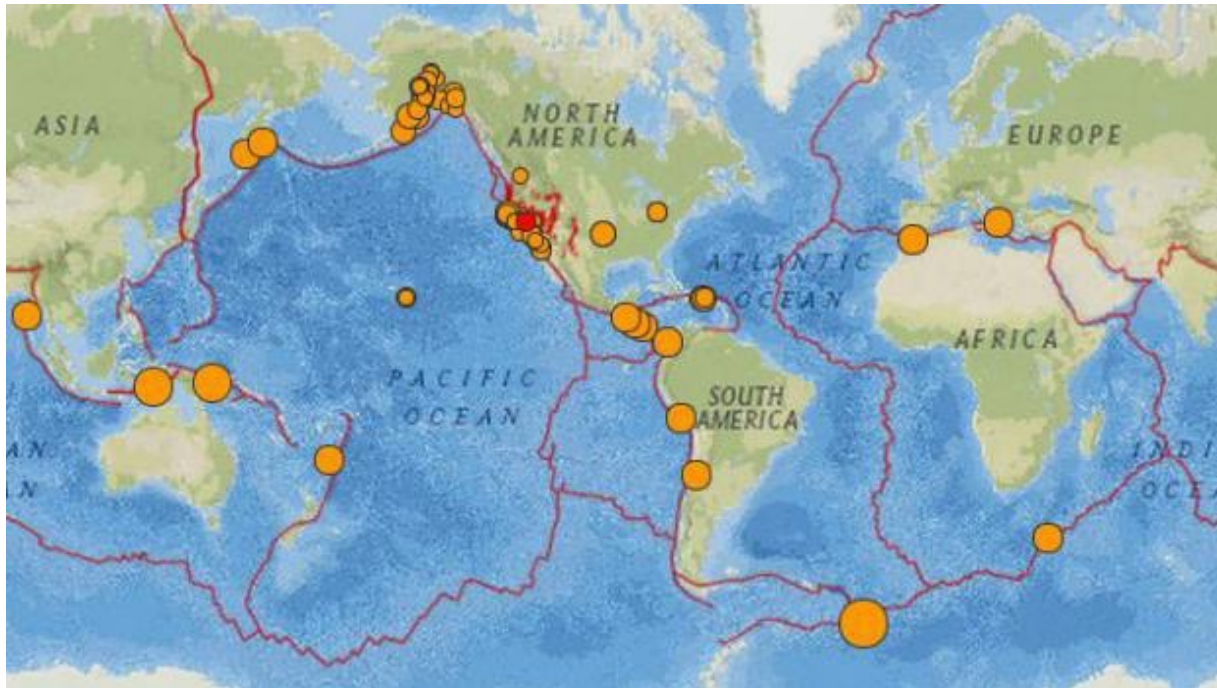
Earthquakes and Ecosystems

Name: _____

Teacher: _____

Date: _____

A map of the world's fault lines. Red lines indicate tectonic plate boundaries (faults) and orange dots indicate areas where earthquakes have often occurred.



The **San Andreas Fault** extends approximately 800 miles through California, running from north to south. It forms the tectonic boundary between the Pacific Plate and the North American Plate. The San Andreas Fault is a transform fault, meaning that two plates slide past one another. Imagine placing two slices of pizza on the table and sliding them past one another, letting the edges touch. Bits of pepperoni and cheese from one slice will crumble across the boundary and fall onto the other slice. The same thing happens with the fault. The geology and landforms along the fault are very complicated.

Top image from: http://arctic-news.blogspot.com/2013_09_01_archive.html

Bottom image from: <http://wonderopolis.org/wonder/whose-fault-is-an-earthquake>

We often think about how earthquakes can affect human populations. But what kind of impact can earthquakes have on natural ecosystems? Create four hypotheses below.

Mountains

1. My hypothesis is that in the mountains, earthquakes could.....

Notes from presentation:

My hypothesis was correct or incorrect because....

Forests

2. My hypothesis is that in the forest, earthquakes could.....

Notes from presentation:

My hypothesis was correct or incorrect because....

Landmasses

3. My hypothesis is that landmasses could be affected by earthquakes if.....

Notes from presentation:

My hypothesis was correct or incorrect because....

Coastline

4. My hypothesis is that along the coastline, earthquakes could.....

Notes from presentation:

My hypothesis was correct or incorrect because....