

Where is the Best Place to Locate a Geothermal Power Plant? Teacher Guide

Geothermal energy comes from heat stored within the Earth. In this activity, students will use Google Earth to explore where the Earth is hot. They will

1. Explore two volcanoes.
2. Explore features in “hot Earth” areas in Iceland and in the United States.
3. Determine where to locate a geothermal power plant in the Northwest United States.

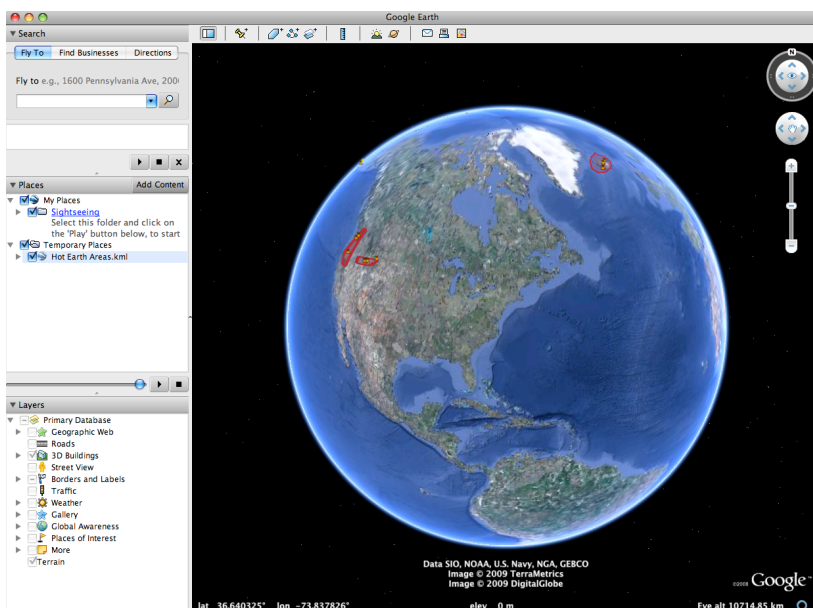
Model the following procedural instructions with your students. It is recommended that you display your computer image at the front of the classroom.



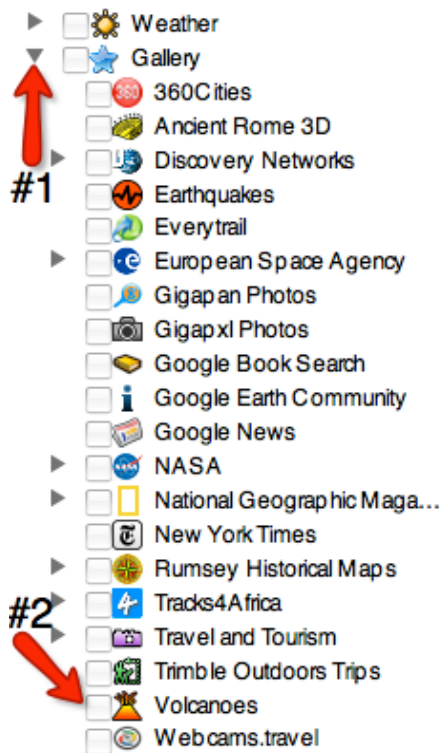
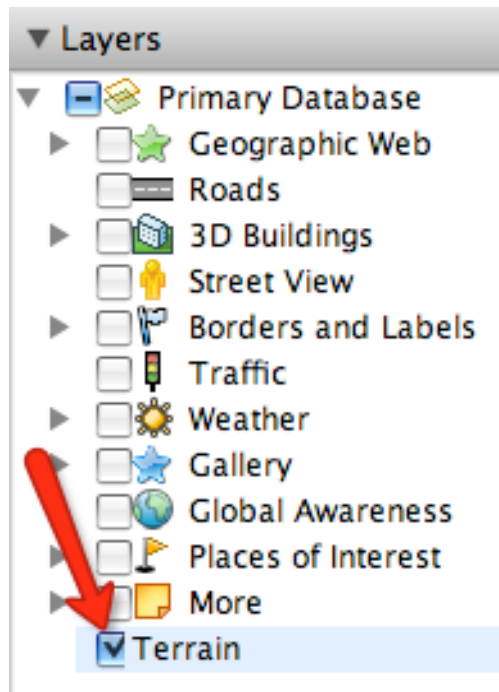
Step 1: Download data.

- a. Open your Web browser. Go to **www.ei.lehigh.edu/learners/energy/**
- b. Click on **Where is the Best Place to Locate a Geothermal Power Plant?** and minimize the Web page to the dock.

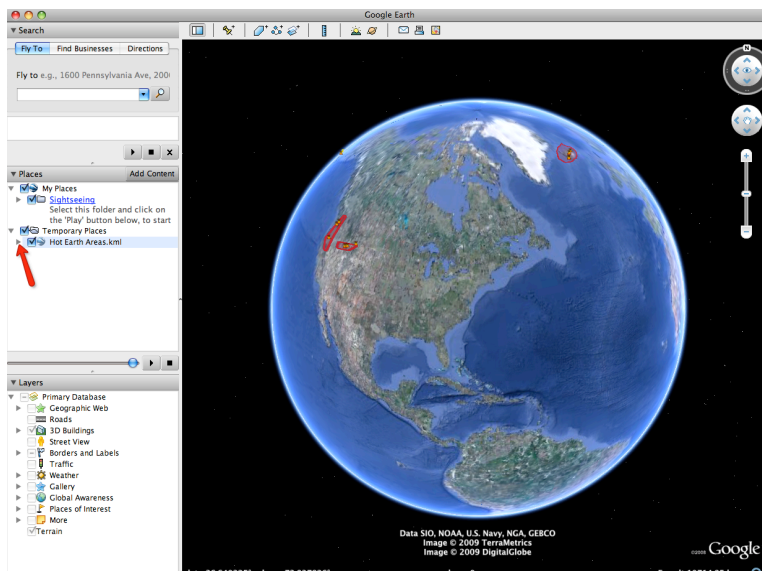
The file is displayed in Google Earth.



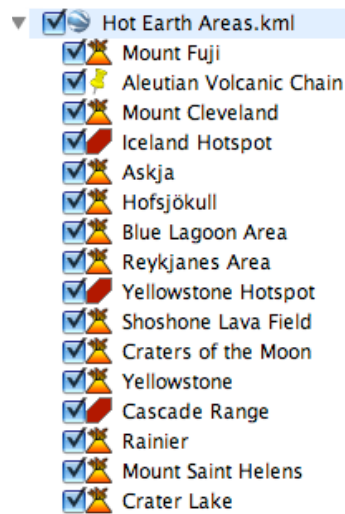
- c. Check to make sure that only the box to the left of **Terrain** in the **Layers** window in the left panel has a checkmark (see arrow below).
- d. Click the arrow to the left of **Gallery** in the **Layers** window in the left panel (see arrow #1 below). Make sure **Gallery** is not checked. Scroll down and check to make sure the box to the left of **Volcanoes** is **not** checked (see arrow #2 below).



- e. Click the arrow to the left of “**Hot Earth Areas.kml**” in the left panel (see arrow below).



The Hot Earth Areas drop-down list will extend (see below). If you cannot see the whole list, scroll down.



Step 2: Explore two volcanoes.

- a. **Double-click on Mount Fuji** in the **Places** window.
Google Earth will zoom you in to Mount Fuji for you to view it. Mount Fuji is in Japan.


Mount Fuji is a cone-shape mountain. Note that it has a crater at the top. Mount Fuji is a volcanic mountain with very high elevation. Note the snow on the mountain. This tells you that the mountain is high.

- b. **Double-click on Aleutian Volcanic Chain** to view it.
This is a chain of volcanic islands that marks the boundary between the Pacific and North American tectonic plates.
- c. **Double-click on Mount Cleveland** to view it.
Mount Cleveland is part of a cluster of volcanic islands in the central Aleutian Islands of Alaska. It is a cone shaped volcanic mountain that has a crater.



Step 3: Explore hot Earth area features in Iceland.

- a. **Double-click on Iceland Hotspot** in the **Places** window to fly to this hotspot. A **hotspot** is an area with high volcanic activity because of high heat flow from within the Earth. The country of Iceland is located on a hotspot.
- b. **Double-click on Askja** in the **Places** window to view it.

NOTE: Uncheck the box to the left of  **Iceland Hotspot** in the **Places** window. This will turn off the red overlay and you will see features more clearly.

- c. What does Askja look like? Does it appear to have a volcanic crater or dome? Does it have a crater that now looks like a lake? Do you see evidence of a lava flow? Or does it look like something else?



Instruct students to write a description of Askja in the **Features in Hot Earth Areas Data Chart** on their field guide.

Helpful hint: Tell students they can use the **navigation controls** at the top right of the screen to explore features in more detail.

- d. **Double-click** on **Hofsjökull** (pronounced /hof yo cul/) in the **Places** window to view it.



Instruct students to complete the **Features in Hot Earth Areas Data Chart** for **Hofsjökull**.

- e. **Double-click** on **Blue Lagoon Area** in the **Places** window to view it.

- f. What does the Blue Lagoon Area look like? Does it appear to have water? Do you observe smoke? What do you think the nearby buildings are for?



Instruct students to write a description of the Blue Lagoon Area in the **Features in Hot Earth Areas Data Chart** on their field guide.

- g. **Double-click** on **Reykjanes Area** (pronounced /re:kjə,næs/) in the **Places** window to view it.

- h. What does the Reykjanes Area look like? Does it appear to have water? Do you observe smoke? What do you think the nearby buildings are for?



Instruct students to write a description of the Reykjanes Area in the **Features in Hot Earth Areas Data Chart** on their field guide.



Step 4: Explore hot Earth area features in Yellowstone.

- a. **Double-click** on **Yellowstone Hotspot** in the **Places** window to fly to this hotspot. This is one of the hot Earth areas in the US.

- b. **Double-click** on **Shoshone Lava Field** in the places window to view it.

NOTE: Uncheck the box to the left of  **Yellowstone Hotspot** in the **Places** window. This will turn off the red overlay and you will see features more clearly.

- c. Does it appear to have a volcanic crater or dome? Does it have crater that now looks like a lake? Do you see evidence of a lava flow? Or does it look like something else?



Instruct students to write a description of Shoshone Lava Field and the area around it in the **Features in Hot Earth Areas Data Chart** on their field guide.

Helpful hint: Tell students they can use the **navigation controls** at the top right of the screen to explore features in more detail.

- d. **Double-click** on **Craters of the Moon** and **Yellowstone** to view them. Repeat step **c** above.




Instruct students to complete the **Features in Hot Earth Areas Data Chart**.



Step 5: Explore hot Earth area features in the Cascade Range.

- a. **Double-click** on **Cascade Range** in the **Places** window to fly to it. This is a mountain range that includes both volcanoes and non-volcanic mountains.
- b. **Double-click** on **Rainier** in the places window to view it.

NOTE: **Uncheck** the box to the left of  **Cascade Range** in the **Places** window. This will turn off the red overlay and you will see features more clearly.

- c. What does Rainier look like?



Instruct students to write a description of Rainier and the area around it in the **Features in Hot Earth Areas Data Chart** on their field guide.

Helpful hint: Tell students they can use the **navigation controls** at the top right of the screen to explore the surrounding area in more detail.

- d. **Double-click** on **Mount Saint Helens** and **Crater Lake** to view them. Repeat step **c**.



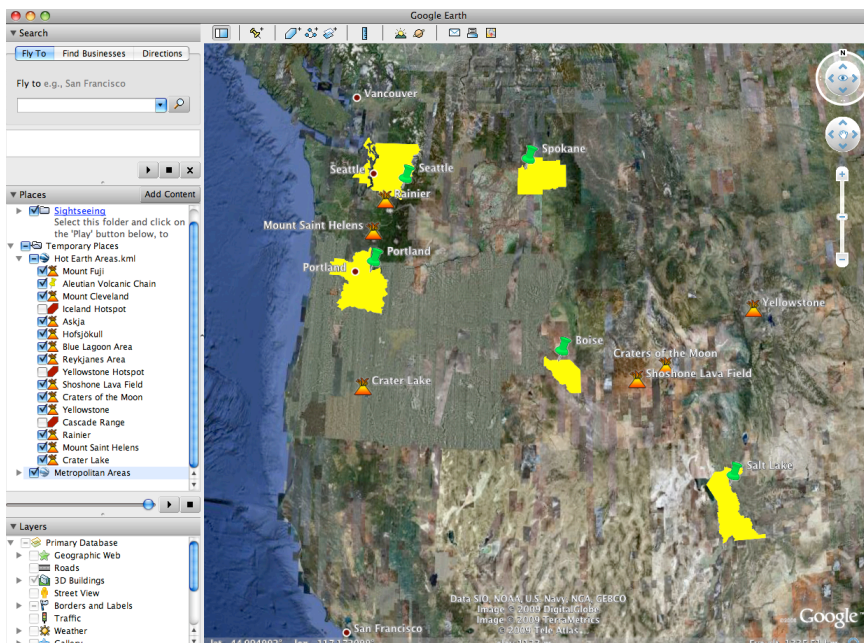
- e. Instruct students to complete the **Features in Hot Earth Areas Data Chart**.



Step 6: Examine metropolitan areas (areas with cities and suburbs) in the Northwest US to determine where to locate a geothermal power plant.

- Click on your Web page in the dock to maximize it. Do not quit the Google Earth application.
- Click on **Metropolitan Areas in the Northwest US**.

The file is displayed in Google Earth.



Five metropolitan areas are displayed in yellow: **Seattle, Portland, Spokane, Boise, and Salt Lake City**. A metropolitan area is a large population area. The populations of these areas are presented in the table below.

Metropolitan Area	Population
Seattle	3,263,497
Portland	2,159,720
Spokane	456,175
Boise	587,689
Salt Lake City	1,099,973

- Check the box to the left of the  **Yellowstone Hotspot** and **Cascade Range** in the **Places** window to see the areas where the Earth is hot in the northwest US.



Instruct students to examine the locations of the metropolitan areas and the locations of the hot Earth area features and answer **questions 1 - 4** on their field guide.



Instruct students to answer **questions 5 - 8** on their field guide.