

Volcanoes

A volcano is an opening in the crust of the Earth through which magma and gases can escape to the surface, or a mountain that is formed from one or more volcanic eruptions.

Volcanoes act as an important force in shaping landscapes and creating new landforms. Their eruptions can be destructive but they can also help to cool the earth temporarily, as particles from a volcanic eruption are released into the atmosphere and shade incoming solar radiation. Through volcanic activity, mineral deposits and other natural features are discovered and used by people around the world.

In this assignment, you will learn about where volcanoes are located, and about the effects of volcanic and tectonic processes in Canada and around the world.

The following tutorials should be referenced to help you complete the assignment:

- [Introduction to ArcGIS Tutorial](http://bit.ly/25IKOM4) - <http://bit.ly/25IKOM4>
- [Using Tables and Filters in ArcGIS Online](http://bit.ly/1TRGNtl) - <http://bit.ly/1TRGNtl>
- [Perform Analysis: Create Buffers](http://arcg.is/1hIOoyF) - <http://arcg.is/1hIOoyF>
- [Measure features in ArcGIS Online](http://arcg.is/1iKgABU) - <http://arcg.is/1iKgABU>

Lesson Tasks

Create Maps

Using the National Geographic basemap create three maps by adding data layers and using **Map Notes** to add locations (point, line, polygon) to your map. Each map note should include:

- An applicable **title**,
- Unique and appropriate **symbolology**,
- A **picture** (that you have found online) related to the location,
- And a **description**, written in paragraph form.

Your map should include the following **locations** and **associated data**. Use supplied data where relevant:

Map 1 – Exploring Volcanoes in Canada and Around the World

1. **Search and add data layers:**
 - a. World Volcanoes by EarthScienceAtlas
 - b. Earth's Tectonic Plates by EsriCanadaEd
2. **Volcanoes in Canada.** In your description, include the tectonic plates that are found in this region of Canada.
3. **Filter the World Volcanoes data** (Field = SimpleType) to view the patterns of the three major types of volcanoes: **Composite**, **Cinder** and **Shield**.
- Q What's the most common type of volcano and list the locations where are they found in the world?
4. Locate the following composite volcanoes:
 - a. **Mount Saint Helens**, Washington. In your description, include details about this famous volcano. (Hint: Go to USGS <http://pubs.usgs.gov/fs/2000/fs036-00/fs036-00.pdf> to learn more about this natural disaster)
 - b. **Mount Garibaldi**, British Columbia. In your description, include details about this sleeping giant. (Hint: Go to the Global Volcanism Program <http://volcano.si.edu/volcano.cfm?vn=320200> to learn more about this volcano)

5. **Create a multi-ring buffer** that covers **100, 200, 300 and 400 kilometres** around **Mount Garibaldi** to view the possible impact the volcano would have if it was as explosive as the eruption of Mount Saint Helens in 1980. Evaluate the geographic and environmental impact Mount Garibaldi would have if it erupted and the effects covered the same distance as Mount Saint Helens (Ash from the eruption reached communities approximately 400 km away).

Map 2 – Plate Boundaries: Where the action happens!

1. **Search and add data layers:**
 - a. Tectonic Plate Boundaries by Esri_TESS
 - b. Volcanoes - Eruption Observed by Esri Canada Education
2. **Filter the Volcanoes - Eruption Observed** data layer to view only the volcanoes that have erupted in the last 20 years. (Hint: Last year erupted is at least 1996)
3. **West coast of North America.** In your description, include the following information:
 - a. Were there any eruptions in Canada in the last 20 years?
 - b. Were there any eruptions within 100 kilometres of Canada's borders?
4. **The Ring of Fire** - the region where most of the eruptions occur in the world. In your description, include the following information:
 - a. **Measure** the length of this ring of volcanoes. Where does it begin and where does it end?
 - b. List the continents are located close to the Ring of Fire?
 - c. State the type of plate boundaries found in this region and explain why most eruptions occur in this area.

Map 3 – Locate Significant Places through Volcanic and Tectonic processes

1. **Mid-Atlantic Ridge.** In your description, answer the following question:
 - a. What tectonic process is occurring along the ridge and why is this significant?
(Hint: Go to the Geological Society <http://bit.ly/2amgsUY> to learn about the importance of the Mid- Atlantic Ridge)
 2. **Country of Iceland.** In your description, include information on why this place is significant to the study of plate tectonics.
 3. **The Hawaiian Islands.** In your description, include information on why these islands are a unique "hot spot."
 4. **The island of Surtsey, Iceland.** Include in your description, the importance of this place. When and how the island was formed? (Hint: Go to UNESCO <http://whc.unesco.org/en/list/1267> to learn more about this)
 5. **Add a feature of your choice** that was created by volcanic or tectonic processes. This can include mountain ranges, hot springs, seamounts or hot spots. Include in your description 2-3 sentences on why this feature is important and what volcanic or tectonic processes were involved in its creation.
- Q Volcano activities contribute in many ways to the diversity of our planet. In 2-3 paragraphs, outline the benefits and hazards of volcanism.

