



Geoscape Ottawa-Gatineau

Grade 7 Lesson Plans to accompany the Geoscape Ottawa-Gatineau poster and website
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Theme One: Introduction to Geoscape

List of Expectations		
Grade	Strand and Topic	Expectations
7	Science: Earth and Space Systems The Earth's Crust	<ul style="list-style-type: none"> investigate the formation of the physical features of the Earth's crust
7	Geography: Patterns in Physical Geography	<ul style="list-style-type: none"> identify and explain how landforms are used to delineate regions draw cross-sectional diagrams locate relevant information from primary sources (aerial photographs, satellite images)

Overview

This Geoscape theme includes lessons that introduce students to the Ottawa area in terms of its location in Canada, as well as its prominent topographic and geological features including the three main river systems, namely, the Ottawa River, the Rideau River and the Gatineau River. Students will be given the opportunity to discover features relative to landmarks in the Ottawa area that are already known to them, in order to help them situate themselves, their school and their home with respect to important areas. Students will also have the opportunity to view aerial photographs of the Ottawa region and to draw profiles using topographic maps in order to appreciate the relationship between topography and geological regions.

At the end of these lessons, students will be able to:

- situate the Ottawa-Gatineau area on a globe as well as on a geological map of Canada
- locate the three main river systems
- identify important landmarks such as the Rideau Canal, the Parliament Buildings, etc
- discover the topography of the Ottawa-Gatineau area using topographic maps (top view) and profiles (cross-sectional diagrams)
- explain the relationship between geological regions and topography

Suggested Lessons	Brief Description
Students Take Notes	Living with our geological landscape
Key Word Game	Crossword puzzle
Lesson 1	Find Ottawa-Gatineau Situating this area on a globe and on a geological map of Canada and identifying the various geological areas in Canada and within the Ottawa-Gatineau area.
Lesson 2	From the air View air photos of the Ottawa-Gatineau area and locate important landmarks as well as the three main river systems.
Lesson 3	Making a topo : Make a topographic map of a "sweet potato" mountain.
Lesson 4	Sideways topo: Using a topographic map of the Ottawa-Gatineau area, draw a profile (cross-sectional diagram).
List of related web sites and resources	<p>This web site offers many useful educational resources including frequently asked questions and answers for students, possibility of video loans and contact for local tours or talks. http://gsc.nrcan.gc.ca</p> <p>Prospectors and Developers Association of Canada Mining Matters is a comprehensive website on rocks, mineral and mining http://www.pdac.ca/miningmatters/index.html</p>

Students take notes:

Geoscape Ottawa-Gatineau

Living with Our Geological Landscape

The National Capital area is mostly a lowland consisting of flat lying ground.

The Ottawa River is a large river that flows through the area.

Two main rivers flow into it

- the Gatineau River
- the Rideau River

To the North and West of the lowland, there are more rugged hills that belong to the Canadian Shield, which is made up of very old rocks.

Rocks take a long time to form and are often moved and changed by forces, heat and pressure.

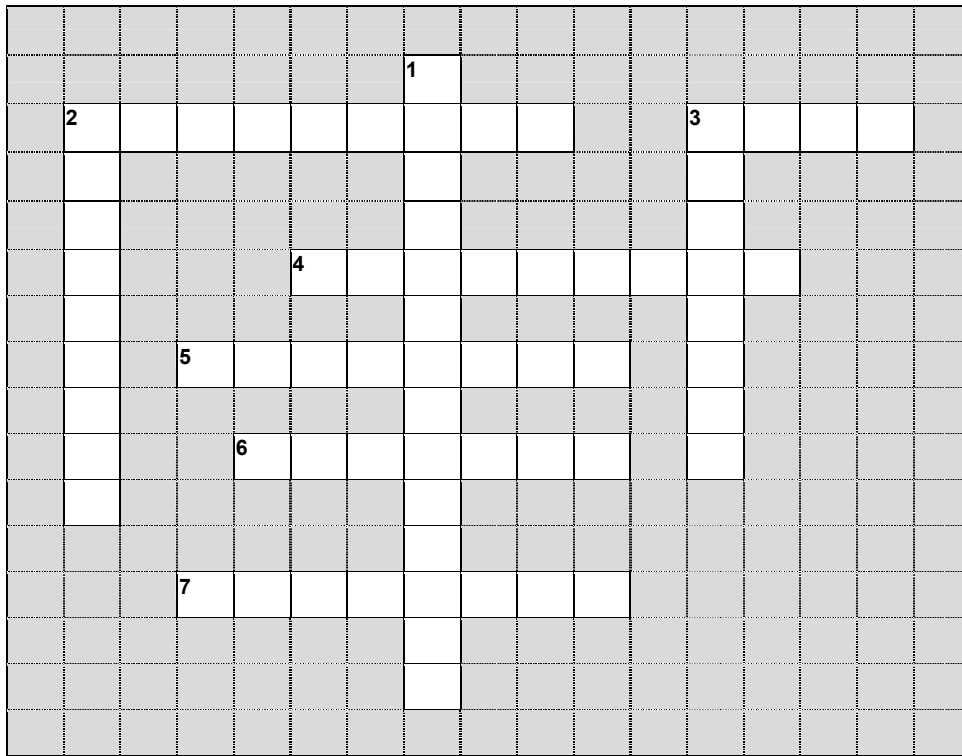
Geological Time is measured in millions of years and throughout this large period of time, the Ottawa-Gatineau area has experienced:

- mountain building (formation of hills, mountains and valleys)
- erosion (wearing down of rocks)
- tropical and temperate seas (different climates)
- glaciers (large sheets of flowing ice formed from compression of snow)

“Geoscape” is a term used to describe the geological landscape of the Ottawa-Gatineau area, which has been, and continues to be, reshaped by earth processes.

Understanding how our geoscape works is essential to the wise use of the land.

Geoscape



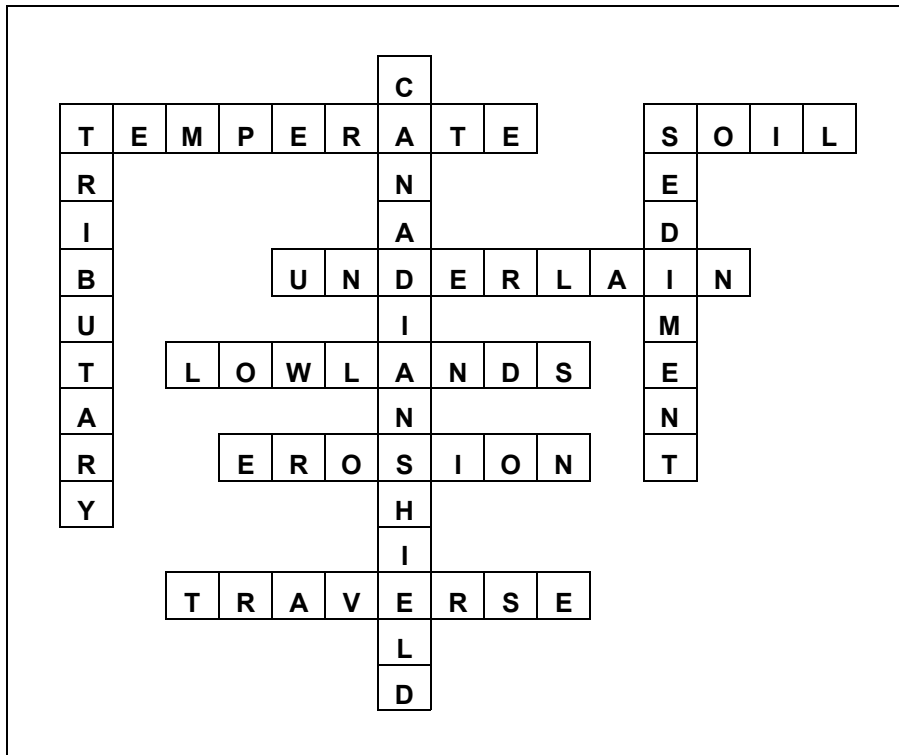
ACROSS

- 2. an area where the temperature is mild
- 3. the loose material containing organic matter, usually forming the top layer of the ground
- 4. has something situated underneath
- 5. low-lying relatively flat geographic area with very little change in elevation
- 6. the process of something wearing away
- 7. to travel across or through something

DOWN

- 1. formed in Precambrian times 570 million years ago (2 words)
- 2. a river or stream that flows into a larger one
- 3. loose pieces of rocks and minerals that were transported and deposited by wind, ice or water

Geoscape



1.1 Lesson 1: Find Ottawa-Gatineau

Brief Description

This lesson consists of a class discussion and demonstration, which will allow students to situate the Ottawa-Gatineau area on a globe and on a geological map of Canada.

Suggested Materials

Geoscape poster

Four sheets of paper marked “N”, “S”, “W” and “E”

Masking Tape

World globe

Two hard-boiled eggs

Overhead projector or LCD computer projector

Pointer

Overheads: Geoscape image, Earth’s interior, Geological map of Canada (Overheads can be viewed from website if using LCD Projector or can be printed on transparent acetates for Overhead projector)

Duration 2 x 40 minute periods

Lesson Instructions

Part One: Geoscape Poster

1. Introduce students to the Geoscape Ottawa-Gatineau poster.
2. Focus on the Geoscape Map at the centre of the poster and point out the following:
 - The Ottawa River
 - The Rideau River
 - The Gatineau River
3. Give students a sense of the direction by showing that the Ottawa River is the border between Ottawa, Ontario and Gatineau, Quebec. Point out that, in this area, the Ottawa River runs east to west. Gatineau is on the north side and Ottawa is on the south side.
4. In the classroom, have students identify which wall is the north wall, south wall, etc. and choose 4 students to label the walls N, E, S, W.
5. Ask students to demonstrate with their arms the direction that the Ottawa River flows. Ask which direction is Quebec and which direction is the USA. Continue to ask for the directions of local landmarks (i.e. shopping centres).
6. Return to Geoscape image and ask students what they think is the main difference between the north side and the south side of the river. They should notice the rugged terrain with hills and mountains to the north and west (Laurentian Highlands) and the relatively flat lying valley to the south (St. Lawrence Lowlands).
7. Ask students to suggest reasons why they think there is such a difference. If desired, note their reasons on the blackboard for later discussion. These reasons should include words related to “mountain building, erosion, deposits, glaciers etc.
8. Read the introductory paragraph on the Geoscape poster:

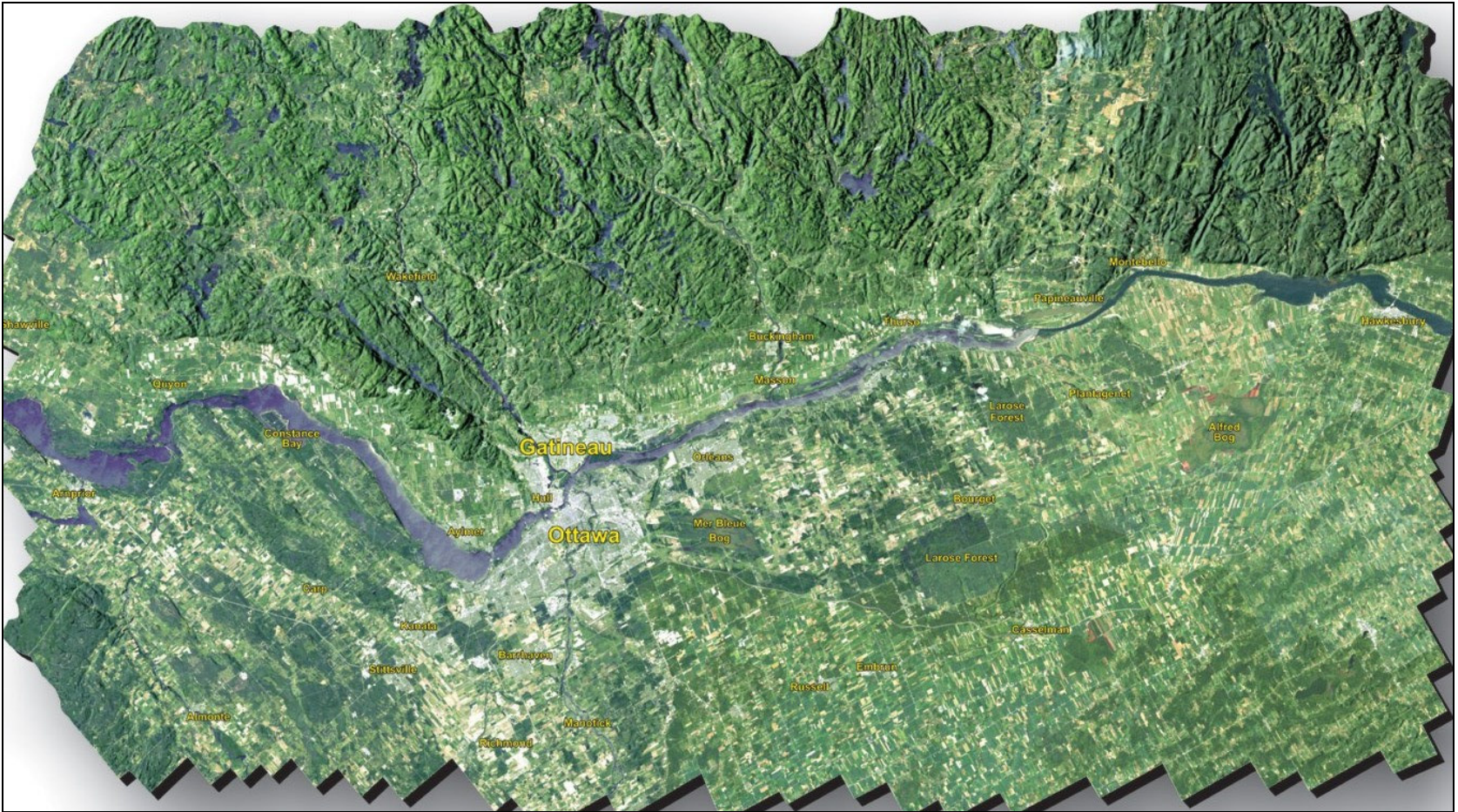
“ We live in the Ottawa valley, a lowland traversed by the Ottawa River and its tributaries and bordered by the rugged terrain of the Canadian Shield. Over geological time, this area has experienced mountain building and erosion, tropical and temperate seas, this ice sheets and erosion by rivers. The Greater Ottawa-Gatineau area is underlain by soil, sediment and rock that have been, and still are being, shaped by earth processes, yielding a geological landscape, or Geoscape. Understanding how our geoscape works is essential to the wise use of the land.”
9. Discuss the vocabulary with students. Refer to the glossary for definition of underlined words.

Part Two: World Globe

1. Using a globe, have students locate the Ottawa-Gatineau area.
2. Discuss the following
 - What surrounds the Ottawa-Gatineau Area? (Province, Country, Continent)
 - The nature of the borders of a country or continent (political)
 - What is under the oceans (land, valleys, mountains)
 - What would the world look like if the oceans dried up?
 - What is under the visible land, under the solid Earth's crust? (Lava, Mantle, Core, etc.)
3. Refer to an overhead of Earth's interior. Discuss the different layers.
4. Using the hard-boiled eggs, make an analogy with the Earth's interior. Point out the following features.
 - Although the Earth is very large and an egg is small, the Earth's crust relative to the size of the Earth is about the same thickness as the egg's shell relative to its size.
 - One egg can be cut in half to compare and contrast its layers with that of the Earth.
 - The other egg can be crushed so that the shells are cracked but still attached to membrane thus demonstrating the instability of the Earth's crust, which is made up of moving plates.
 - If time and many eggs are available, students can cut and crack eggs in small groups and make qualitative and quantitative observations.

Part Three: Geological Map of Canada http://gsc.nrcan.gc.ca/map/index_e.php

1. Introduce the Geological Map of Canada to students. (See overhead)
2. Discuss the main section of the map, namely
 - Precambrian Shield (largest area of Archean rocks in the world; older than 2.5 billion years) (pink area)
 - Three deformed belts (Appalachian belt in the southeast, Cordillera belt of western Canada and the Inuitian belt in the Arctic Islands. Mainly Phanerozoic rocks (around 600 million years old)
 - The Devonian Basins which consist of relatively younger Paleozoic rocks (about 400 million year old) (blue area)
 - The Western Canada Basin east of the Cordillera which consists of even younger, undeformed Cretaceous rocks (about 100 million years old) (green area)
3. Point out the location of Ottawa-Gatineau area on the geological map and ask students how they would describe the types of rocks found in this area.
4. Refer to Geoscape map to point out the sedimentary basin to the south of the Ottawa River and the much older, deformed Precambrian rocks to the north of the river.

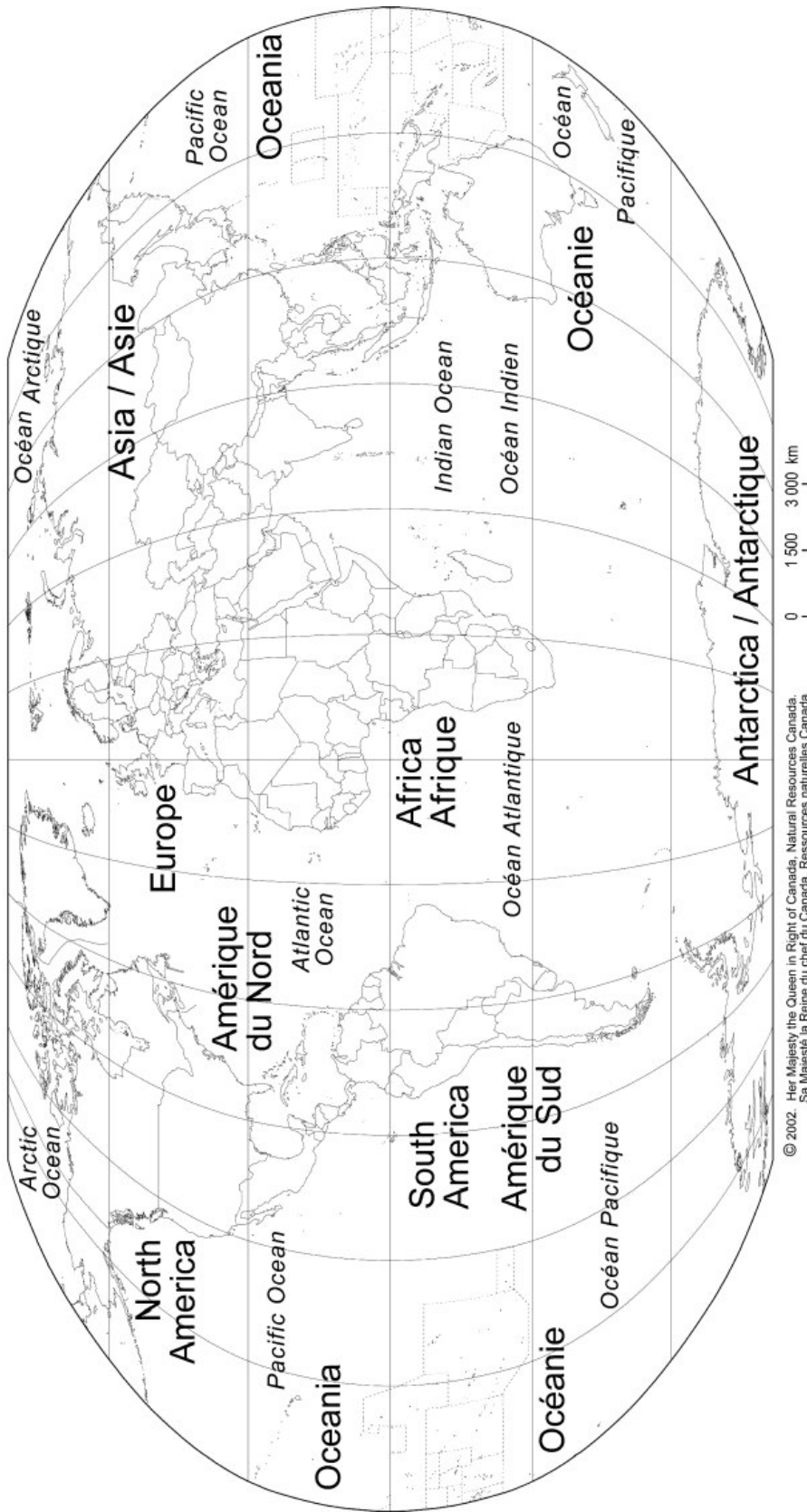


Overhead: Geoscape Ottawa-Gatineau satellite image http://geoscape.nrcan.gc.ca/ottawa/index_e.php

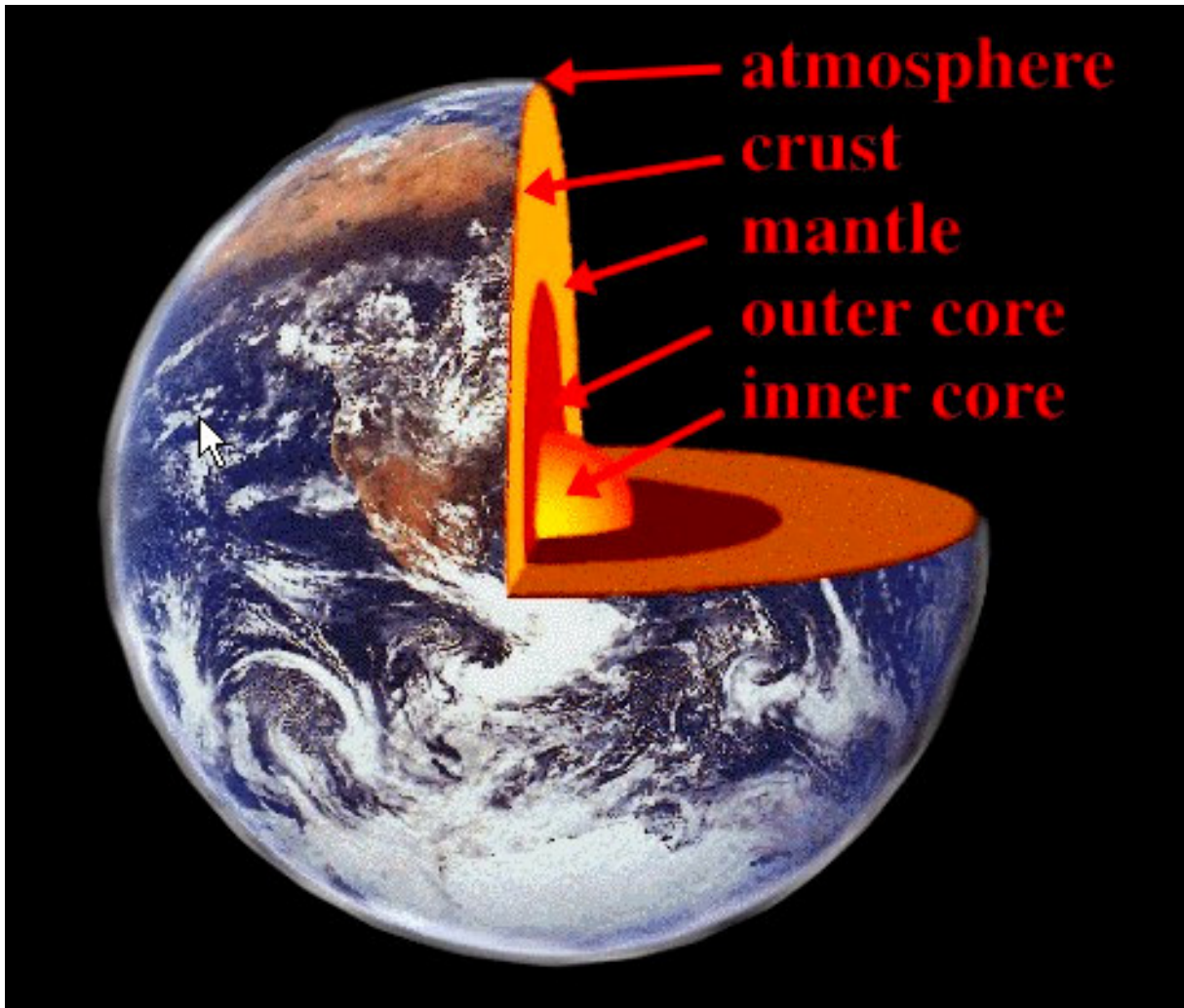
Landsat TM (5/7) Shaded Relief Fusion (Landsat TM 7.)

Data collected by USGS/EROS Data Center and provided courtesy of Canada Centre for Remote Sensing.

THE WORLD / LE MONDE



Overhead: World Map http://atlas.gc.ca/site/english/maps/reference/outlineworld/world02/referencemap_image_view



Overhead: Earth's Interior http://www.windows.ucar.edu/tour/link=/earth/Interior_Structure/earth_cutbk.html

Image is courtesy of Windows to the Universe, <http://www.windows.ucar.edu>

1.2 Lesson 2: From the Air

Brief Description

This lesson requires computer access to the City of Ottawa web site, which provides air photos of the Ottawa-Gatineau area. http://www.ottawa.ca/city_services/maps/atlas/aerial_photos_en.html
Google Maps website, with the satellite option selected, can also be used. <http://maps.google.com/>

This lesson can be done as a demonstration whereby the teacher uses an LCD projector to show students the air photos. If a computer room is available, students can work in groups of two or three, each group sharing a computer terminal and following the steps taken by the teacher. Students will be able to locate the three main river systems as well as important landmarks.

Suggested Materials

Overhead projector or LCD computer projector

Internet access

Pointer

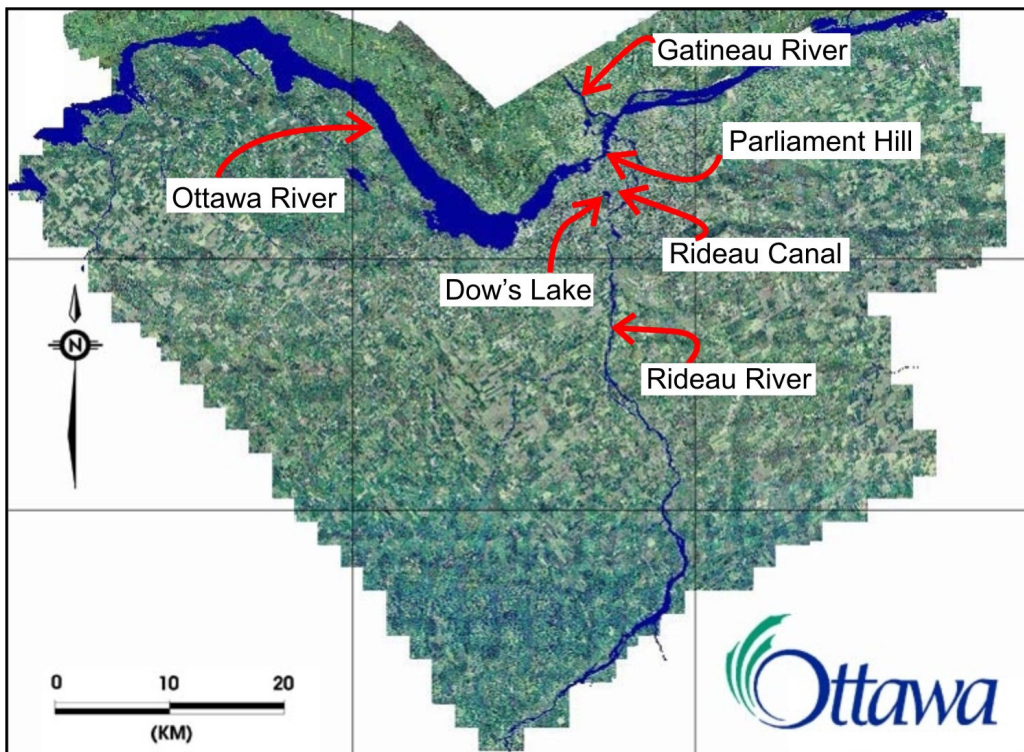
Computer room if available, with one computer terminal for each group of two or three students

Duration 30 - 40 minutes

Lesson Instructions

Part One: The Nature of Air Photographs

1. Explain to students that air photographs are taken from airplanes.
2. Brainstorm on the advantages of air photos compared to printed maps. e.g.
 - Provide a real world view of Earth's surface
 - Can be used like a map if the scale is known
3. Access Website: http://www.ottawa.ca/city_services/maps/atlas/aerial_photos_en.html
4. Click on **photo** to get to main air photo mosaic of the Ottawa-Gatineau area (http://www.ottawa.ca/city_services/maps/atlas/airphotos/level1/map1_en.html).



City of Ottawa air photo mosaic

5. Point out the following:
 - Ottawa River
 - Gatineau River
 - Rideau River
 - Rideau Canal
 - Dow's Lake
 - Parliament Hill
6. Indicate the difference between the topography of the northern and far western region (Laurentian Highlands of the Canadian Shield) and the topography of the southern and southeastern region (the younger St-Lawrence Lowlands).
7. Show students how you can zoom into any area on the air photo by clicking on any area. Discuss the relative scale as you are zooming in.
8. If using a computer room, have students access the same website on their computer.

Part Two: Finding Parliament Hill and Dow's Lake

1. Have students follow the steps you take as you demonstrate using your computer and projector. If you are not in a computer room, you may have students take turns coming to the main computer to follow your instructions
2. Click on main air photo at the intersection of the three rivers to zoom in to find Parliament Hill.
3. As the next air photo appears (http://www.ottawa.ca/city_services/maps/atlas/airphotos/level2/map1-2_en.html), have students notice the following
 - Scale has changed
 - Direction is still the same
 - You can see the Rideau Canal and Dow's Lake better
4. Click just south of the intersection of the Ottawa River and Rideau Canal to zoom in again. (http://www.ottawa.ca/city_services/maps/atlas/airphotos/level3/map1-2-6_en.html).
5. Ask why Dow's Lake has disappeared. Again point out the change of scale.
6. Click again just south of the intersection of the Ottawa River and the Rideau Canal. (http://www.ottawa.ca/city_services/maps/atlas/airphotos/level4/map1-2-6-7_en.html)
7. Ask students if they can see Parliament Hill and ask them if they recognize any other landmarks.
8. Click again just south of the intersection of the Ottawa River and the Rideau Canal. (http://www.ottawa.ca/city_services/maps/atlas/airphotos/level5/map1-2-6-7-3_en.html) This is the final air photo and Parliament Hill is located in the southwest corner.
9. You can repeat the above steps to zoom in on Dow's Lake. You may also extend this activity to have students find their own neighbourhoods.

1.3 Lesson 3: “Sweet Potato Mountain” Topo

Brief Description

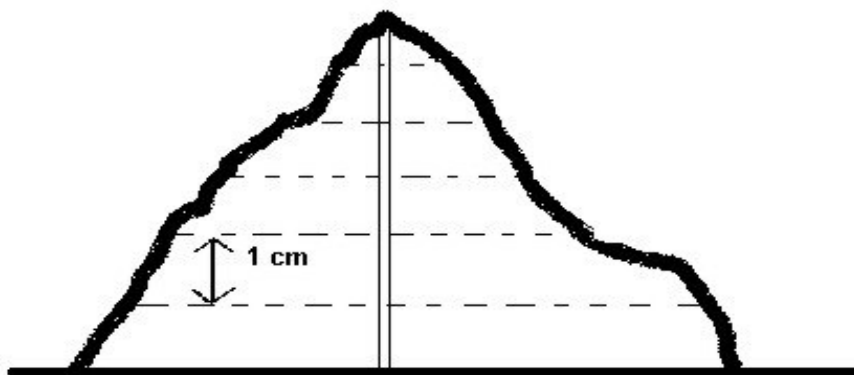
This lesson consists of a short lab where the student creates a topographic map of a mountain using a raw sweet potato as a model.

Suggested Materials

Half of a large raw sweet potato per group
Paper, pencil, ruler, paper towels
Wooden skewer, large toothpicks or dissection picks
Student Hand-out (attached)

Preparation

It is recommended that the teacher cut the sweet potato in 1 cm slices. Students can pierce through each slice to form a central tunnel.



The slices can be re-assembled to original shape
Make photocopies of Student Hand-out (Attached)

Duration 30 - 40 minutes

Lesson Instructions

1. Divide students into groups of 2 to 4.
2. Distribute the pre-sliced “Sweet Potato” Mountain.
3. Distribute the Student Hand-out
4. As students complete this lab activity, ensure that the skewers are handled with care.

Lab: "Sweet Potato Mountain" Topographic Map

Problem: What are topographic maps and why are they created?

Hypothesis:

Material: Half of a raw, pre-sliced sweet potato, skewer, paper, pencil, marker, ruler, paper towel

Procedure:

1. Describe your Sweet Potato Mountain. Use qualitative observations and quantitative observations. (See observation chart)
2. Determine the highest point (the peak of the mountain) and choose one side of the mountain as the "north" side. Label it with "N" on each slice with a marker.
3. Pierce the top slice with the skewer straight down making a vertical tunnel.
4. Continue to pierce each slice so that a single vertical tunnel is pushed through the mountain.
5. Starting with the top slice, place the slice in the centre of a sheet of paper and trace the contour (outline) of the slice and draw a dot where tunnel was pierced and indicate "N" on paper.
6. Place next slice on paper such that the position of tunnel and the "N" are the same as for the first slice and trace the contour of the slice.
7. Repeat step 6 for each slice.
8. Given that each slice is 1 cm thick and that the base of the mountain is set to zero, label each contour line as 1cm, 2cm, 3cm etc.

Observations:

Description of "Sweet Potato" Mountain	
Qualitative Observations	Quantitative Observations
Colour	Height (cm)
Texture	Perimeter at bottom (cm)

Concluding Questions

1. Compare the topographic map you have made to the actual model of "Sweet Potato Mountain".
2. Why are some traced contour lines closer together than others?
3. Which side of the mountain has a steeper slope?
4. Where are the contour lines closer together on your topographic map?
5. What is the relationship between the distance between contour lines and the slope?
6. Where would be the best place to build a house on the mountain? Discuss the problems you would have?
7. Where would be the best place to build a road to get to the top of the mountain?

1.4 Lesson 4: Sideways Topo

Brief Description

This activity consists of drawing a north to south cross sectional profile using a topographic map of the Ottawa-Gatineau area.

Suggested Materials

Attached Activity Sheets

Strips of paper about 1cm X 20 cm

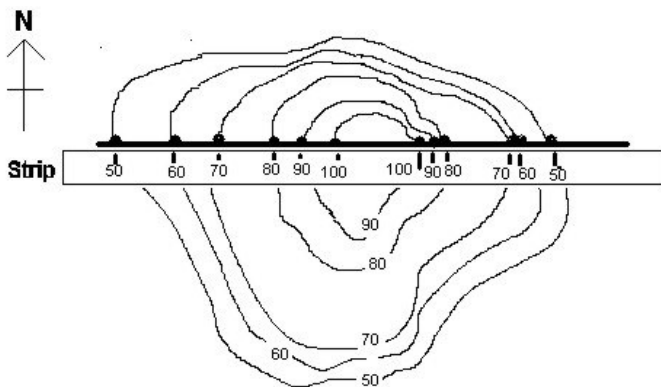
Duration

30 - 40 minutes

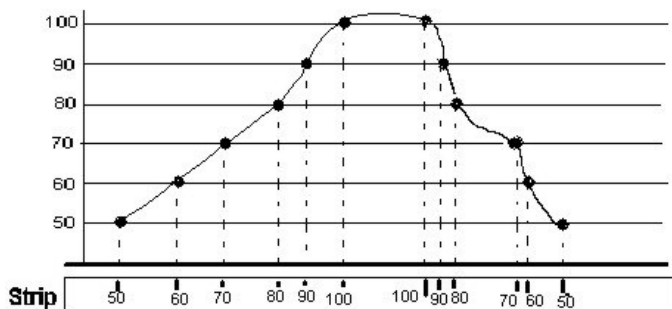
Lesson Instructions

Part One: Cross Sectional Diagram of a Mountain

1. Hand out Activity Sheet No. 1: Cross Sectional Diagram of a Mountain.
2. Follow Instructions on Activity Sheet with Students.



How to label strip of paper



How to plot profile

Part Two: Simplified Cross Sectional Profile of Ottawa Area

1. Hand out Activity Sheet No. 2: Simplified Cross Sectional Profile of Ottawa Area.
2. Have students complete and hand-in their profiles.
3. If time permits, have students draw a west-east line on topographic map and plot the profile.

Activity Sheet No. 1: Cross Sectional Diagram of a Mountain

Part One: Drawing a West to East Cross Sectional Profile of a Mountain

Instructions:

1. Figure 'a' consists of a topographic map of a mountain. This is the top view of the mountain. The numbers on each contour line represent the elevation at that position in metres.
2. A thick line, labelled A-B, has been drawn from the west to east.
3. Mark the elevation of each point where a contour line crosses the A-B line with a dot.
4. Place the edge of a strip of paper along the A-B line. Make a mark on your strip of paper wherever the edge of the paper crosses a contour line. Label the elevation.
5. Place the strip along the A-B line of Figure 'b'.
6. Plot the elevations by drawing vertical lines from the points up to their corresponding elevation line.
7. Connect the elevation points with a smooth curved line to complete the cross-sectional profile.
8. This is the side view of the mountain from west to east.

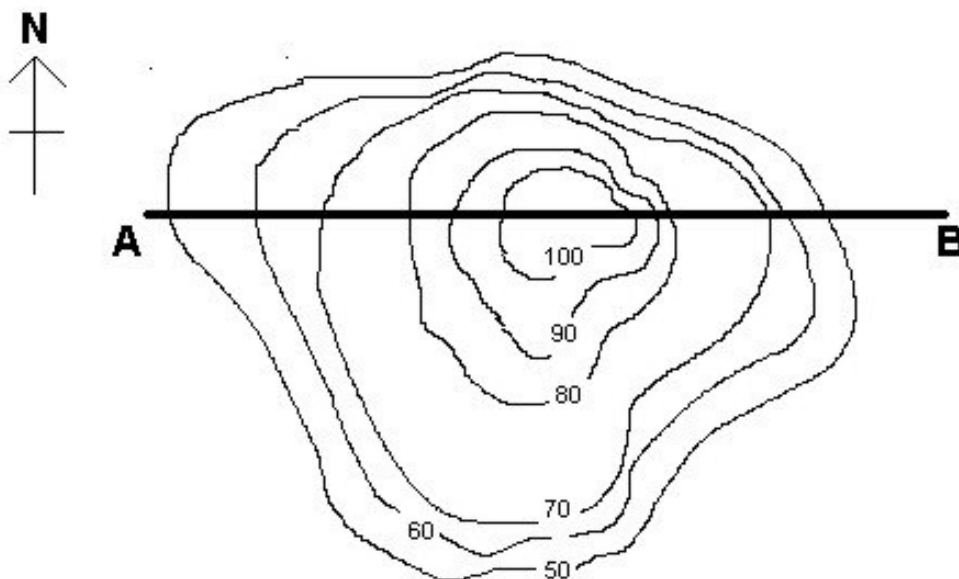


Figure a. Topographic Map of Mountain (west to east line)

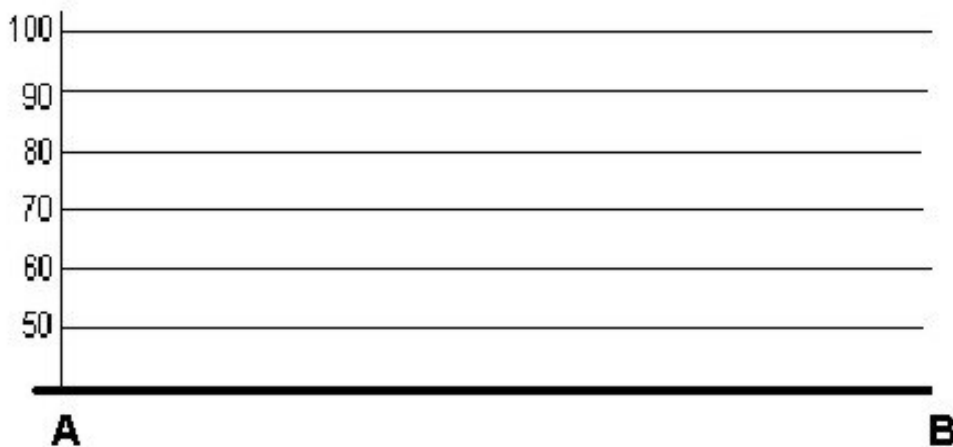


Figure b. Cross Sectional Profile of Mountain (west to east line)

Part Two: Drawing a North-South Cross Sectional Profile of a Mountain

Instructions:

1. Figure 'c' consists of the same topographic map of a mountain. The only difference is that the thick line labelled C-D has been drawn from the north to the south.
2. Repeat steps 3 to 7 from Part One. Draw the profile on Figure 'd'.
3. This cross sectional profile represents the side view of the mountain from north to south.
4. What differences are there between the north-south and the west-east profiles?

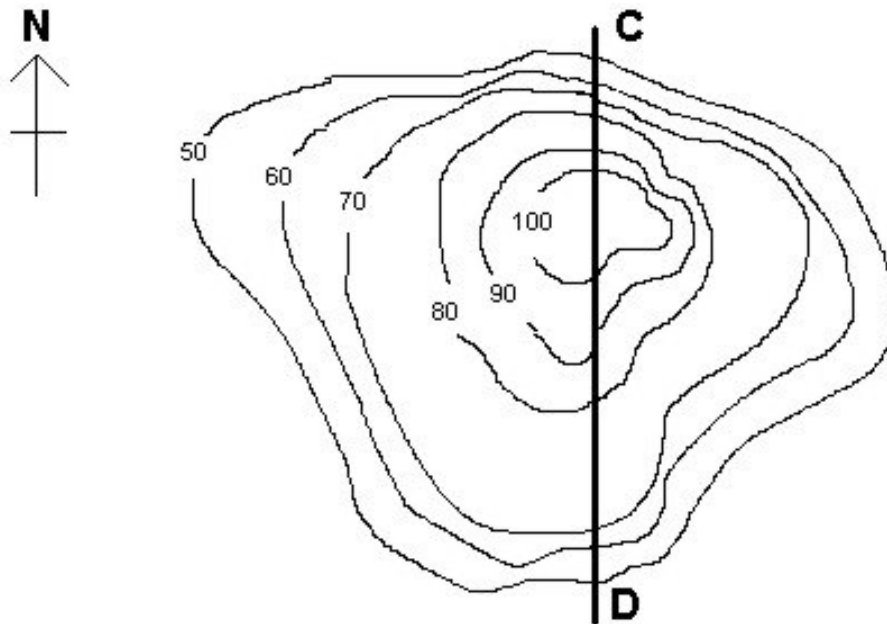


Figure c. Topographic Map of Mountain (north to south line)

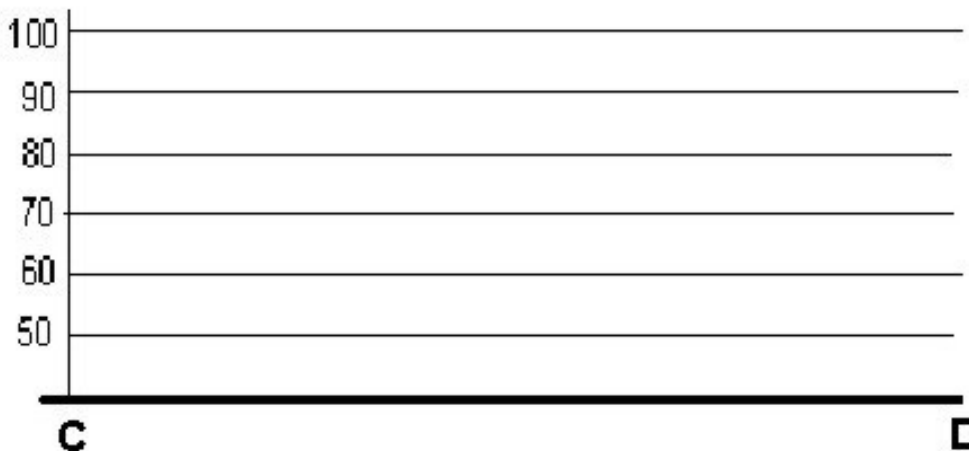
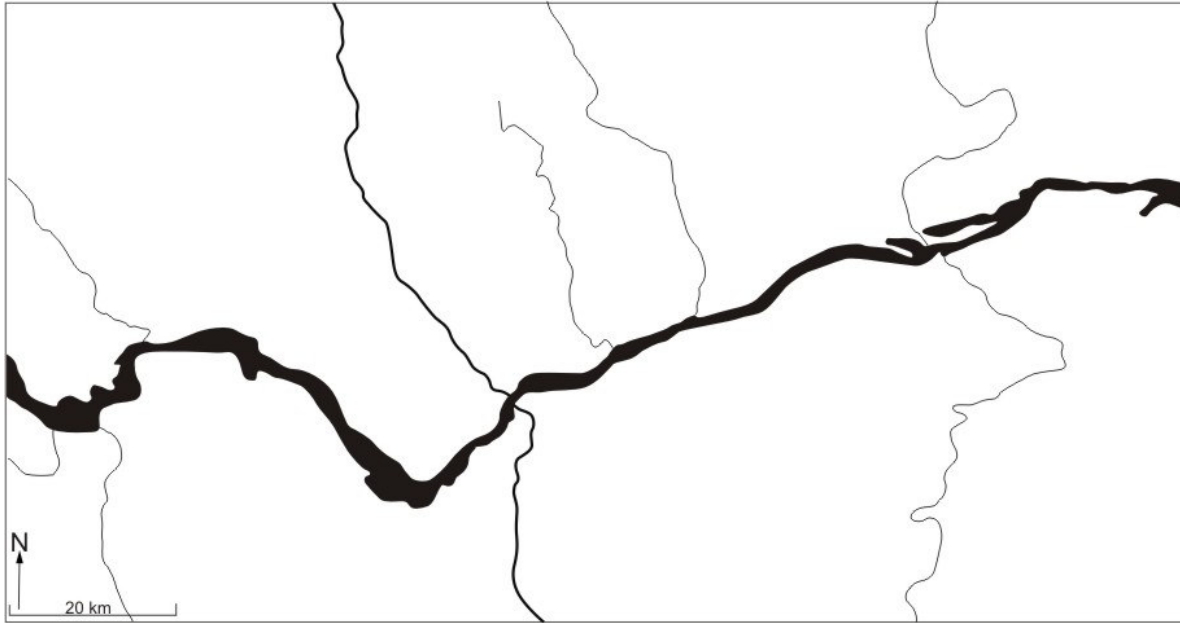


Figure d. Cross Sectional Profile of Mountain (north to south line)

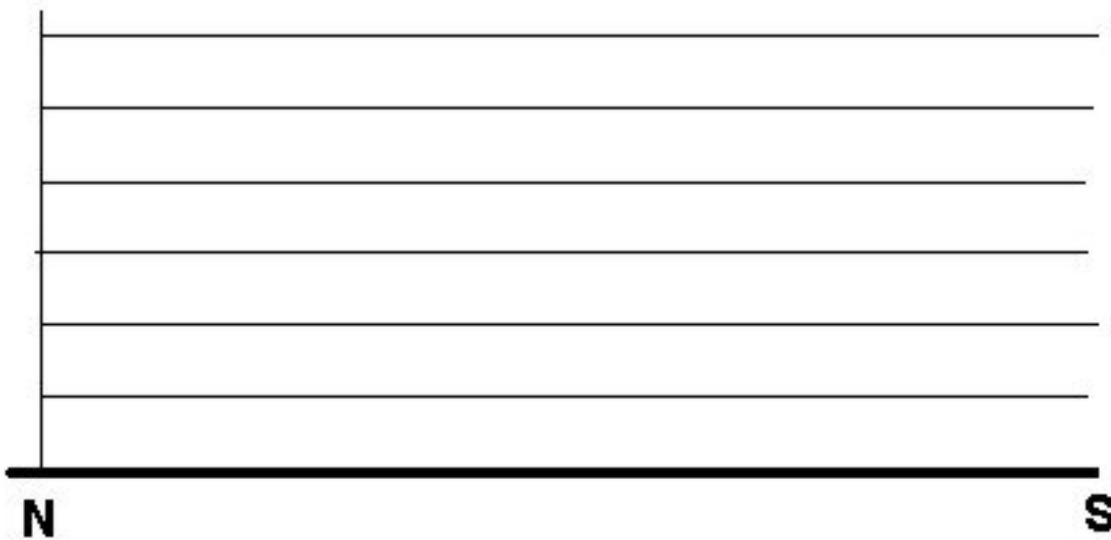
Activity Sheet No. 2: Freehand profile of the Ottawa-Gatineau area

Instructions:

1. By now, you should have a better understanding of how topography can be represented both from a top view and a side view.
2. Draw, free-hand, possible contour lines of the top view of a topographic map of Ottawa-Gatineau area. (Do not worry about the exact elevations.)
3. Second, sketch, free-hand, a north to south profile across the area.
4. How would you describe this profile?
5. Describe what the west to east profile of the Ottawa-Gatineau area would look like?
6. If you have time, sketch a west to east profile.



Free Hand Topo of Ottawa- Gatineau Area



Cross Sectional Profile of the Ottawa-Gatineau Area (north to south line).