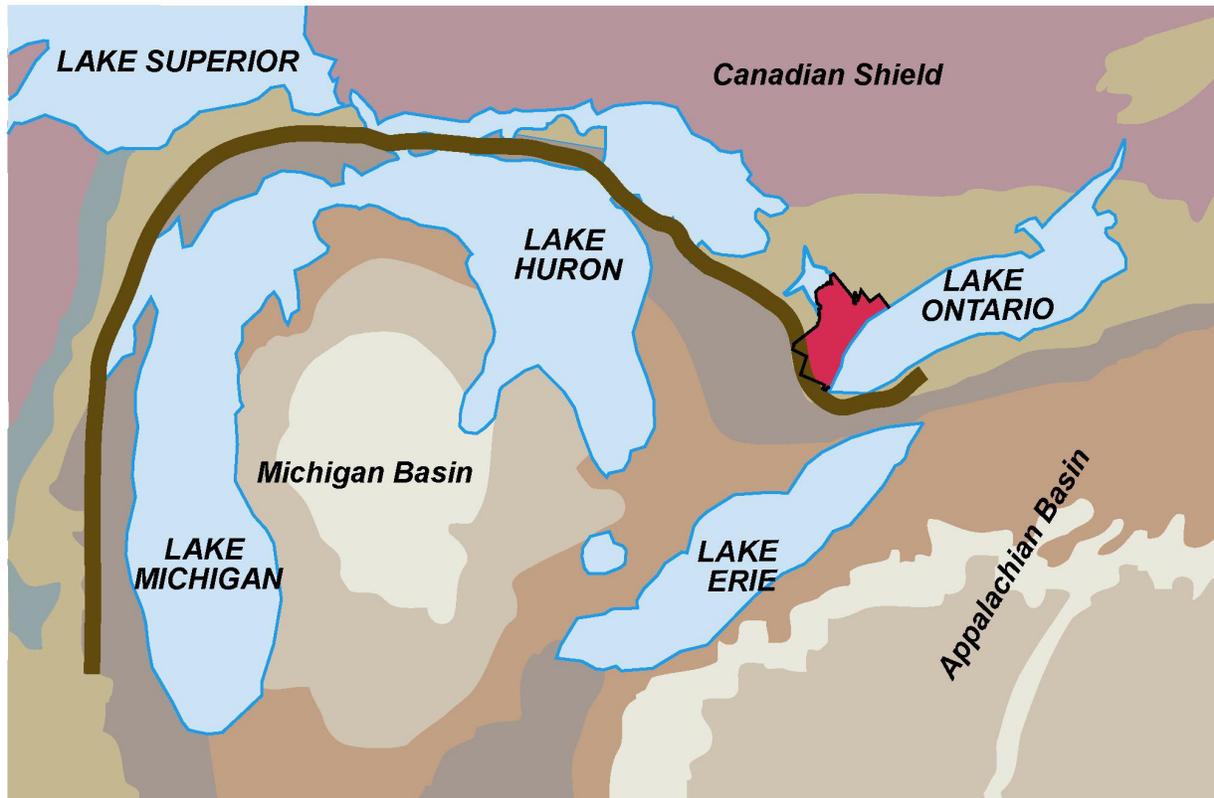


The Niagara Escarpment

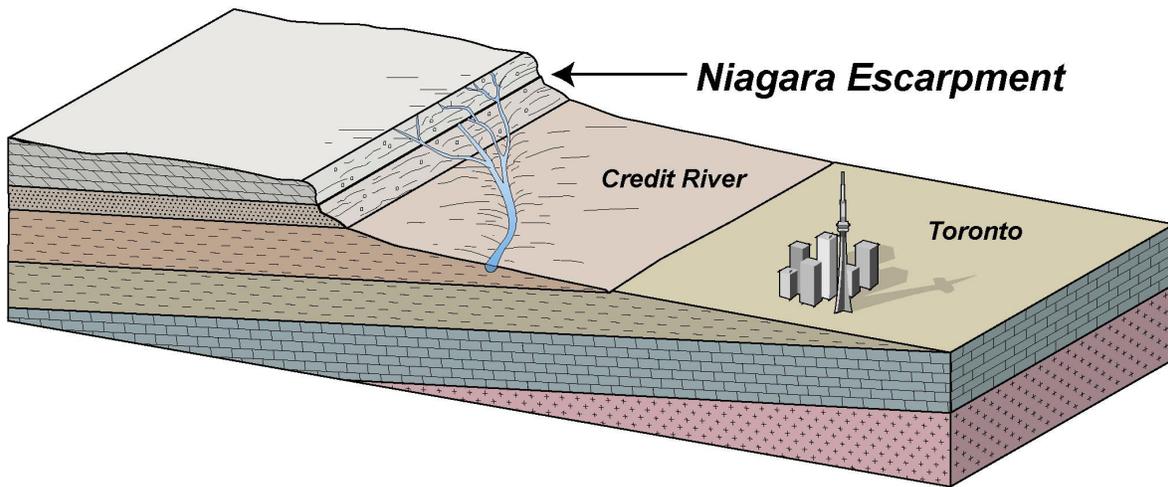
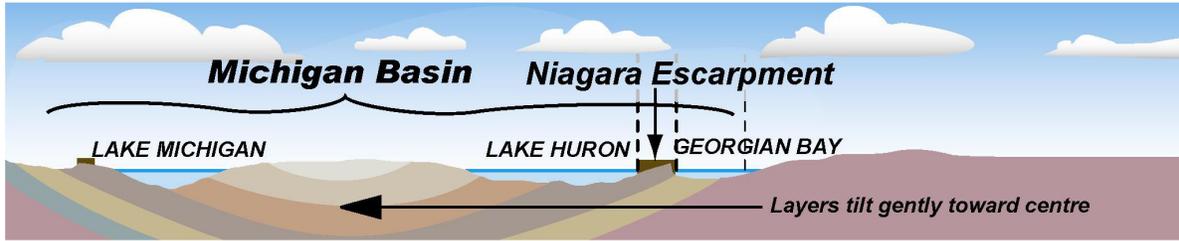


The Niagara **Escarpment** is southern Ontario's most prominent topographic feature, extending more than 500 kilometres from western New York, through Niagara Falls and the western part of the Greater Toronto Area (GTA), and north to Tobermory. It then disappears under Georgian Bay until it reaches Manitoulin Island. The Niagara Escarpment also extends west into Michigan. As can be seen on the map, the escarpment is generally near the circular edge of the Michigan **Basin**.



The Niagara Escarpment extends from western New York, through the GTA all the way up to Manitoulin Island and into Michigan and Wisconsin.

The multiple layers of rock making up the Niagara Escarpment are the result of the accumulation of sediments in a shallow sea. Over time, the sediments were compacted and became **sedimentary rocks**. Layers of sand became **sandstone**, while mud turned into **shale**. Layers containing abundant animal skeletons and shells became **limestone** and **dolostone**, which preserved these remains as **fossils**. The layers of sedimentary rocks **dip**, or slope, down toward the centre of the Michigan Basin at approximately 6 metres per kilometre. As a result, the various layers of rocks are exposed at the surface across the basin.

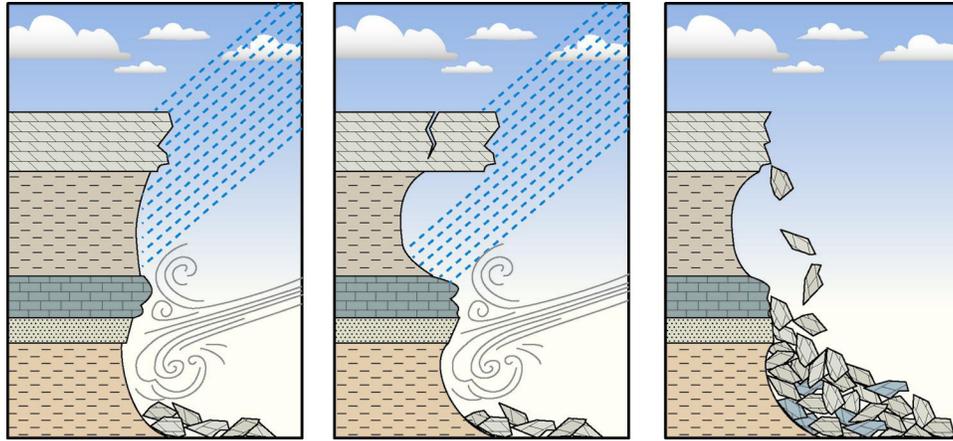


LEGEND

Pennsylvanian	Devonian	Ordovician	Precambrian
Mississippian	Silurian (Niagara Escarpment)	Cambrian	Niagara Escarpment

The Michigan Basin is a circular depression in the underlying **Precambrian** age bedrock. When the layers of sediments were deposited they formed this large bowl-shaped structure. This is why the layers of sedimentary rock contained within the basin are at an angle. This angle, also known as *dip*, allows the various layers of rock to be exposed on the surface.

The escarpment, as we see it today, was formed because of the different rates of erosion of the rock layers. Over the 350 million years since the tropical seas disappeared from southern Ontario, rain, waves, wind, ice, frost and glacial meltwater eroded and carried away shale and sandstone, the softer rocks, leaving the hard dolostone cap as a steep cliff. This process is known as **sapping** and continues today.



Over millions of years, erosion removed the softer underlying shale and sandstone, causing the more resistant dolostone cap rock to break away under its own weight. This resulted in a vertical rock face. The process, known as sapping, has caused the formation and retreat of the Niagara Escarpment.

One of the best places to examine the sedimentary rocks of the Niagara Escarpment is along the Niagara River **Gorge**. The gorge has been cut by the Niagara River, which carries water from Lake Erie to Lake Ontario. Before reaching Lake Ontario, the river takes a great fall over the Niagara Escarpment, forming Niagara Falls. The power of the falls is harnessed to generate hydroelectric power. The action of the falls erodes the softer sedimentary rocks beneath the harder dolostone cap rock, much like what occurs along the rest of the escarpment, only at a much greater rate. The dolostone is undercut until it has such little support, that gravity and the force of the water cause it to break off.



Niagara Falls



Niagara River Gorge

Along the Niagara Escarpment, fractures in the dolostone cap rock allow large quantities of rain and snow to percolate downwards where reservoirs (**aquifers**) store vast amounts of **groundwater** that supply wells and water bottling operations. These aquifers slowly release water along the escarpment face as springs, forming the **headwaters** for many rivers and streams, including the Credit River and Bronte Creek.

Today the Niagara Escarpment region is a rich mosaic of forests, farms, wetlands, lakes, recreational areas, the Bruce Trail and quarries together with villages, towns and cities. It features over 100 sites of geological significance, including many in which fossils of the *Silurian* and *Ordovician* Periods are preserved. The *topography* of the Niagara Escarpment has created an environment which supports a multitude of micro-climates each serving as home to specialized plant and animal species. It is for this reason that in 1985 the government of Ontario enacted the Niagara Escarpment Plan. In 1990, the Niagara Escarpment was designated as a World Biosphere Reserve by the United Nations. Now it is our responsibility to maintain a balance between the natural habitats and the commercial uses of the treasures found along the Niagara Escarpment.

The Niagara Escarpment



Why is the Niagara Escarpment so Important?

After you have finished reading the **Information Bulletin** *The Niagara Escarpment* complete the following questions in your notebook.

1. Water flowing from Lake Erie tumbles over the Niagara Escarpment into Lake Ontario forming Niagara Falls. This has been occurring since the last glacier left the region about 10,000 years ago. The force of flowing water has caused a tremendous amount of erosion. If Niagara Falls has existed for the last 10,000 years and the estimated rate of erosion at the falls is 0.85 metres per year, calculate how far the falls have retreated. Use this information and the scale on the map to mark the existing location of the falls as well as the original location of the falls. Show your calculation in your notebook.
2. What are fossils? Why would fossils be found in the Niagara Escarpment? In addition to the **Information Bulletin**, use research tools such as books or the Internet to develop your answer.
3. Why are the layers of sedimentary rocks in southern Ontario at an angle?
4. When traveling west from Toronto along highway 401 you will see that the rocks of the Niagara Escarpment are exposed at the surface just west of the GTA. Because of dip, these rocks extend deeper underground as you continue to travel west towards Windsor. If the distance between the escarpment and Windsor is 315 kilometres and the dip is 6 metres per kilometre, calculate how deep these escarpment rocks will be found beneath the surface in Windsor. Draw a diagram to illustrate your answer.
5. The Great Lakes – Superior, Michigan, Huron, Erie and Ontario – and their connecting channels form the largest fresh surface water system on Earth and a vital shipping route. Lakes Erie and Ontario are connected by the Niagara River. Niagara Falls, however, is an obstacle to navigation into the upper lakes. How has the shipping route between Lakes Erie and Ontario been altered to allow ships to pass around this barrier? Use research tools such as books, maps or the Internet to find the answer.
6. Use the Internet to investigate **five** different ways in which the Niagara Escarpment benefits our lives or is used by people. Does the escarpment create challenges for the development of surrounding land? Write a paragraph describing the importance of the Niagara Escarpment.

The Niagara Escarpment



Map of the Niagara Falls Region

