11 Landform Connections

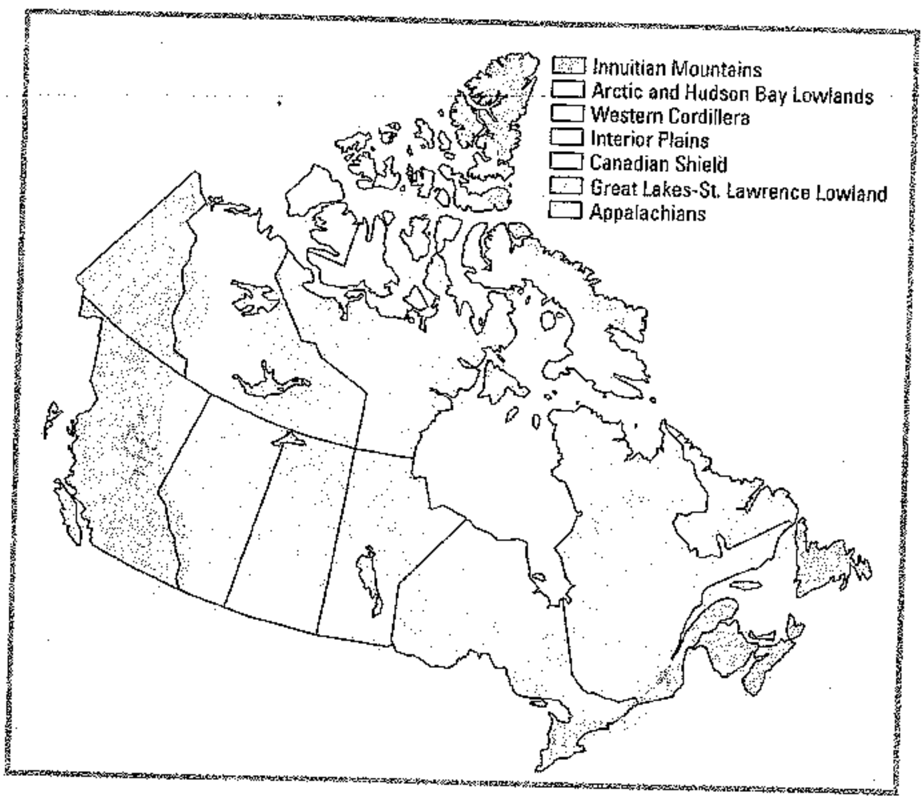
STUDY GUIDE

By the end of this chapter, you will be able to:

- identify and describe Canada's landforms and regions
- describe the effects of glaciers
- use maps and photos to interpret landform and regional relationships
- describe how art reflects Canada's natural landscape

Key Terms

topography
highlands
lowlands
differential erosion
escarpment
rift valley
plateaus
intrusion
fiord
drainage



◁ **Fig. 11-1** *Landform regions of Canada. The white lines indicate ecozone boundaries, which are discussed in Chapter 14.*

INTERNET

To learn more about Canada's landforms, check [illegible]

Canada is a land of great physical diversity. Perhaps this is not surprising since Canada is the world's second largest country, and has the world's longest coastline. We can look at Canada's **topography** by focusing on landforms.

topography: the earth's surface features including vegetation, soils, and those features shaped by people

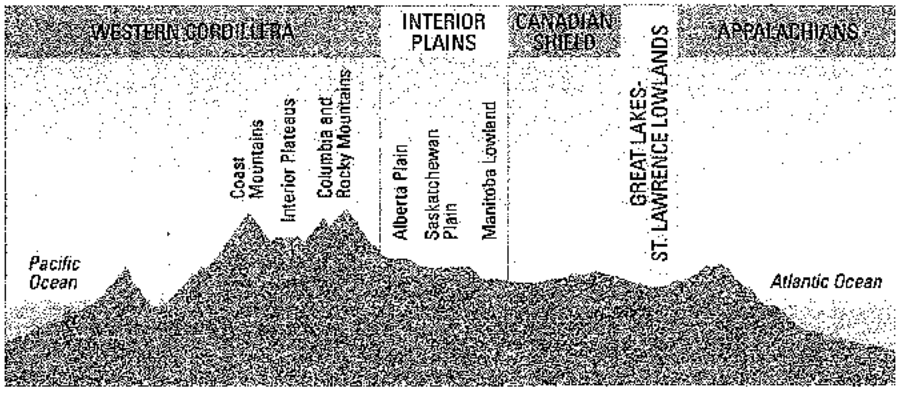
Fig. 11-1 shows Canada's landform regions on a map.

1. What is a landform region? Use your own words.
2. How many landform regions are there in Canada?
3. Which landform region is the largest? Which one is the smallest?
4. a) In which landform region do you live?
   b) Describe the landforms in the region in which you live.

Canada is made up of three distinct types of landforms — **shield**, **highlands**, and **lowlands**. The highlands and lowlands are further subdivided into the regions shown in Fig. 11-2.

THE CANADIAN SHIELD

The Canadian Shield is the geographic foundation of Canada. The Shield underlies not only much of Canada but also parts of the United States. More than half of Canada is covered by the Shield, about 4 800 000 km^2 (Fig. 11-1). Some of the world's oldest rocks (3.96 billion years old) are located in the Shield near Great Slave Lake. Today, most of the Shield is relatively flat with rounded hills of rock which are actually the roots of ancient mountains.



◁ **Fig. 11-2** *Profile of southern Canada's landforms*

Two types of rock, igneous and metamorphic, form most of the Shield. They contain valuable minerals in great quantities. Because of the vast deposits of lead, gold, nickel, copper, zinc, and other important metals, the Canadian Shield is often called the storehouse of Canada's **metallic minerals**. In addition, diamonds have recently been found where ancient volcanoes once existed.

The Precambrian rocks of the Canadian Shield do not contain fossil fuels (coal, oil, and natural gas). The lifeforms that produced these products did not exist at the time the Shield was created.

How were mineral deposits formed in the rock of the Shield? Minerals were present in magma (molten rock) beneath the earth's crust. As magma rose toward the surface, it forced its way into cracks and cavities in the shield rock. This process of magma slowly rising toward the surface took thousands or millions of years. As it cooled, some minerals were deposited in the magma itself. Other deposits were formed when minerals, dissolved in very hot water, were forced deep into cracks in the surrounding rock (Fig. 11-3). This process allowed minerals to be deposited in high concentrations which makes mining worthwhile.

A simple experiment will show you how liquids separate into layers.

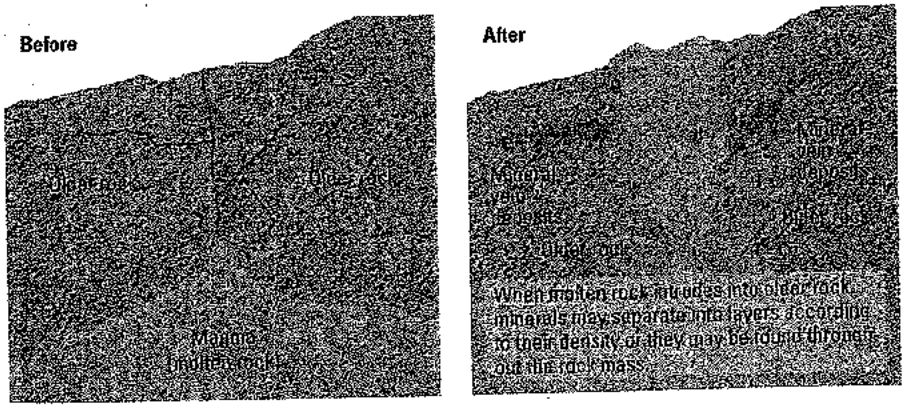
1. Put 20 ml of vinegar and 80 ml of olive oil into a jar with a lid.
2. Shake well and let stand. What happens? Why?
3. Season, salt, and pour on a salad!

As the minerals slowly cooled, they separated into layers according to their density. The lighter ones floated on top of the heavier ones. Those that had similar density floated to the same level. Nickel and copper are often found together because they have similar densities.

In Sudbury, Ontario, large deposits of nickel and copper are mined.

Mining companies are attracted to the Shield because of the presence of metallic minerals. Many cities and towns, such as Sudbury in Ontario, Thompson in Manitoba, and Yellowknife in the Northwest Territories, rely on the mining industry for jobs. The mineral ores are smelted to remove waste materials. The concentrated minerals are shipped to factories in Canada and other parts of the world where they are used to manufacture products we use every day.

smelted: when metal is extracted by melting



◁ **Fig. 11-3** *Minerals may be deposited when molten rock intrudes into existing rock formations.*

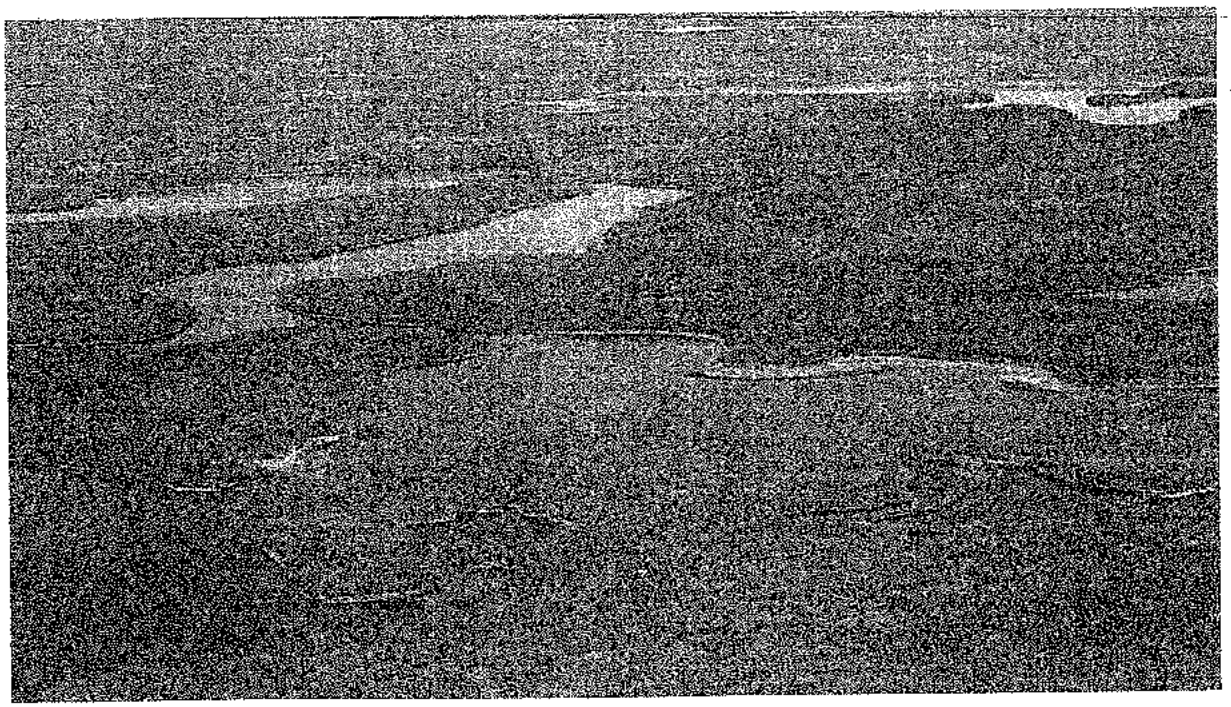
While the Shield is well-suited to mining, it is ill-suited to farming because it has very thin soils. However, it is ideal for recreation because of its scenic rivers, waterfalls, lakes, rock outcrops, and vast forests. The action of the glaciers affected the **drainage** of the Shield. The scraping and gouging action of the ice created depressions in the **bedrock**. These depressions filled with water to form the hundreds of thousands of lakes that now dot the Shield (Fig. 11-4). Because the bedrock is **impervious**, water does not pass through it. The glaciers deposited sand, gravel, and clay which dammed rivers or forced them to flow in different directions. The result is a very disorganized pattern of winding rivers, lakes, and swamps. These rivers and swamps are the breeding ground for the many blackflies and mosquitoes found in the Shield. People visit the Shield to canoe, fish, hunt, and "get back to nature." The tourist industry is very important to the towns and cities in the southern parts of the Shield.

The Shield's plentiful water flows have made it an excellent source of water-generated energy, and the pattern of drainage has affected where hydro-electrical plants are located. The centre of the Shield is much lower than its outer portion. This gives it the appearance of a saucer, with Hudson Bay occupying the low-lying centre. As a result, most of the rivers of the Shield flow toward its centre and into Hudson Bay. Hydro-electric generating stations have been built where the rivers tumble from the Shield onto the Hudson Bay Lowlands. The energy produced by these stations is transmitted by power lines to cities and towns both on and off the Shield.

Glaciers removed enormous amounts of soil, clay, rock, and gravel from the Shield. Today, most of the Shield is covered by a thin layer of soil, and the bedrock is visible in many places.

See the Co-operative Study on glaciation at the end of this chapter for more information about the effects of glaciation on the Canadian Shield.

▽ **Fig. 11-4** *The Canadian Shield: notice the many lakes, trees, and the exposed bedrock.*



CHECK YOUR UNDERSTANDING

1. a) What types of rock make up the platform on which the rest of Canada is built?
   b) What is the topography of the Shield like?
   c) What geologic processes created this topography?
2. Why is the Canadian Shield also referred to as the Precambrian Shield?
3. a) Why is the Shield called Canada's storehouse of metallic minerals?
   b) Using your own words, describe how mineral deposits form.
   c) Why are nickel and copper often found together?
4. Describe the effects of glaciers on:
   a) the land's surface material, such as soil, rocks, and gravel
   b) the drainage of the Shield

ANALYZE AND APPLY

5. The natural beauty, the minerals, the rivers, and the forests are the economic backbone of the Shield. How have these resources aided in the economic development of this region?
6. Many products that you use are made from different kinds of raw material that are found in the Canadian Shield. List at least five products and the raw material from which they are made. For example, this book is made of paper that may come from the trees of the Shield.

THINK AND COMMUNICATE

7. a) On an outline map of Canada supplied by your teacher, draw the borders of the Canadian Shield.
   b) On your map, locate and label the major cities (population over 100 000) on the Shield. Consult your atlas for this information. Save this map for another activity later in this chapter.
   c) How many major cities are there?
   d) Discuss the following questions in a small group:
      i. Why are vast areas of the Shield sparsely populated?
      ii. Could this change in the future? Explain.

THE LOWLANDS

There are three lowland regions surrounding the Shield: the Interior Plains, the Great Lakes-St. Lawrence Lowlands, and the Hudson Bay-Arctic Lowlands (Fig. 11-1). The bedrock under these lowlands is formed mainly of sediments eroded from the Shield. The sediments were laid down in the seas that existed at various times millions of years ago. As the rock particles collected, the weight of the upper layers compressed the lower layers into sedimentary rocks.

◁ **Fig. 11-5** *The Interior Plains*

Interior Plains

The Interior Plains of Canada are part of the Great Plains of North America that stretch from the Arctic Ocean to the Gulf of Mexico (Fig. 11-5). The Interior Plains of Canada extend from the 49th parallel north to the Arctic Ocean, a distance of 2700 km. They are about 1300 km wide in the south but only about 275 km wide in the north.

The Interior Plains were often covered by shallow inland seas. Sediments from the Shield and the Rocky Mountains were deposited in these seas over millions of years. Eventually the sediments were compressed by the weight of the layers above into sedimentary rock. Part of the sedimentary rock deposited in these areas consists of coral reefs that formed close to the surface of seas during the Paleozoic era. The rock layers are several thousand metres thick and took millions of years to form. Today, the reefs are thousands of metres below the surface of the land. They contain much of the oil and gas found in Alberta and Saskatchewan.

Remember that Canada was closer to the equator at this time. Over millions of years, plate movements have placed Canada in its current location.

Mineral deposits also lie below the surface. At various times during the Mesozoic era, shallow seas covered the region that is now Saskatchewan. When they evaporated, thick layers of mineral deposits were left in the dried-out sea beds. These layers are now deep in the earth, covered by newer rocks and glacial deposits. Potash is mined from these layers and used as fertilizer in Canada and overseas. The swamps on the edges of these ancient seas produced plants that were changed eventually into coal which is mined today.

Potash is the name given to potassium chloride compounds. It is chemically similar to common table salt. Saskatchewan is the world's leading producer of potash.

Forces of erosion have also shaped the surface of the landscape. Some sedimentary rocks are hard and resistant; others are quite soft. The softer

resistant: able to withstand the forces of erosion

rock erodes more quickly than the harder rock — a process called **differential erosion**. Different rates of erosion have caused three different levels of elevation on the prairies. Each level is separated by a sharp rise called an **escarpment**. Escarpments form when a harder rock layer that overlays a softer layer resists erosion. Although many people think of the Interior Plains as flat, there are relatively few areas where this is true. The landscape is, for the most part, composed of rolling hills, and deep, wide, river valleys. Overall, the land slopes gently downward from west to east.

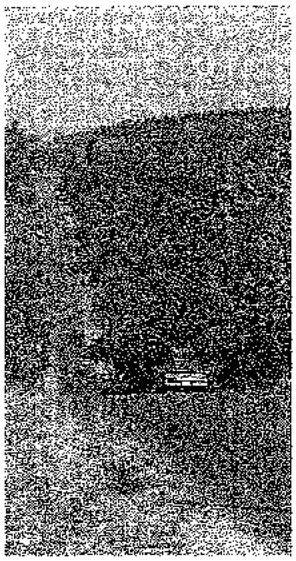
Glaciation has also marked the landscape in visible ways and affected land use. The Interior Plains, like the rest of Canada, were subjected to glaciation. The glaciers left deposits that produced a rounded, gently rolling landscape in many areas. When the glaciers melted, the meltwater formed a large lake over much of what is now southern Manitoba and Saskatchewan. Later, the land rose, causing most of the water to drain into the ocean. Small portions of the ancient lake remain today as Lake Winnipeg, Lake Manitoba, Lake Winnipegosis and Cedar Lake. The floor of this lake was covered by sediments which made it very flat. The former lake bottom was left as flat land in what is now southern Manitoba and Saskatchewan.

This ancient lake, called Lake Agassiz, was larger than all of the Great Lakes combined.

The soil that developed on these sediments is deep and fertile. Grain is grown in many locations in the southern part of the Interior Plains. The area is known as Canada's "breadbasket" because so much wheat is grown here. Cattle are raised in places where the climate is too dry for crops. Agricultural products from this region are used both in Canada and overseas.

Great Lakes-St. Lawrence Lowlands

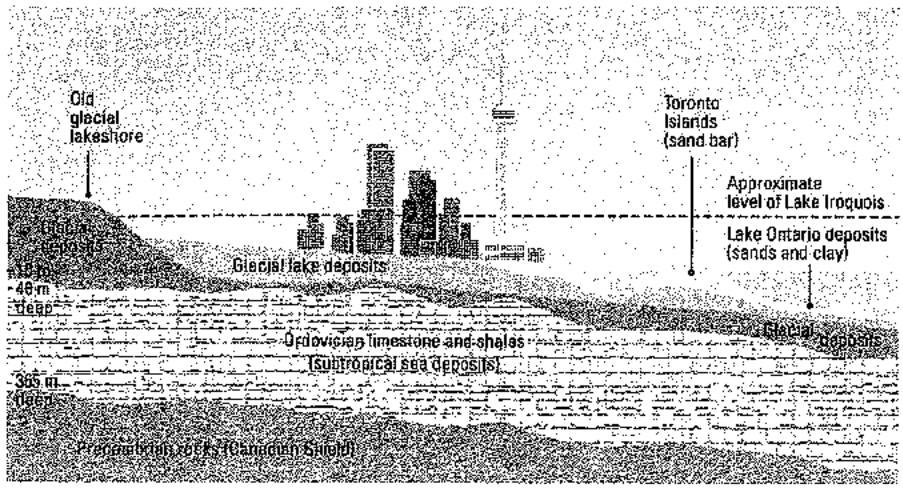
South of the Canadian Shield is a smaller landform region, the Great Lakes-St. Lawrence Lowlands. As you might suspect from the name, the region consists of two parts. The parts are separated by a thin wedge of the Canadian Shield that juts across the St. Lawrence River and extends into the United States near Kingston, Ontario. Like the Interior Plains, these lowlands have bedrock formed of sedimentary rock from the Paleozoic era. The Paleozoic bedrock can be seen in several escarpments in the Great Lakes Lowland. The best known is the Niagara Escarpment which extends from Niagara Falls to Manitoulin Island. The Niagara Escarpment was formed by differential erosion.



△ **Fig. 11-6** *The Great Lakes Lowlands*

Geographers believe that there were water bodies here before glaciation. The glaciers deepened and widened these depressions.

In the Great Lakes portion of the lowlands, glaciation has created a rolling landscape (Fig. 11-6). The glaciers carried huge amounts of material (soil, sand, and gravel) from the Canadian Shield and dumped them throughout the region. The landscape is characterized by flat plains with glacial hills and deep river valleys. The Great Lakes are located in basins that were gouged out by glaciers. The lakes were even larger than they are



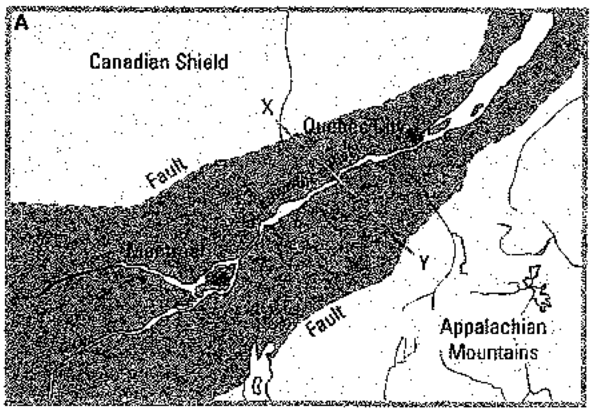
△ **Fig. 11-7** *About 10 000 years ago, the melting glaciers created a glacial lake, Lake Iroquois, that covered the area where Toronto is now situated. The Ordovician was an early part of the Paleozoic era.*

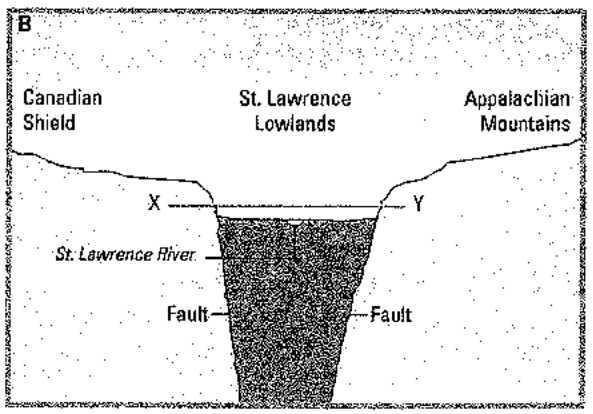
today because of the enormous volume of water from the melting glaciers. They eventually shrank to their present size as the **meltwater** drained into the ocean. The old shorelines of these glacial lakes surround the present-day Great Lakes (Fig. 11-7).

meltwater water resulting from the melting of glacier ice and/or snow

The St. Lawrence Lowland was formed in a different way from the Great Lakes Lowland. A **rift valley** was formed by faulting (Fig. 11-8). This rift valley was flooded toward the end of the last ice age by a part of the Atlantic Ocean called the Champlain Sea.

The Great Lakes-St. Lawrence Lowlands Region is the most southerly region in Canada. It is well-suited to agriculture because of its excellent soils and warm climate. The flat land is also ideal for transportation routes and the development of cities. Because of these factors, it is the most densely populated region in Canada. About 50% of Canada's population lives in the





▽ **Fig. 11-8** *The cross-section in B shows how the St. Lawrence Lowland was created as a result of double faulting.*

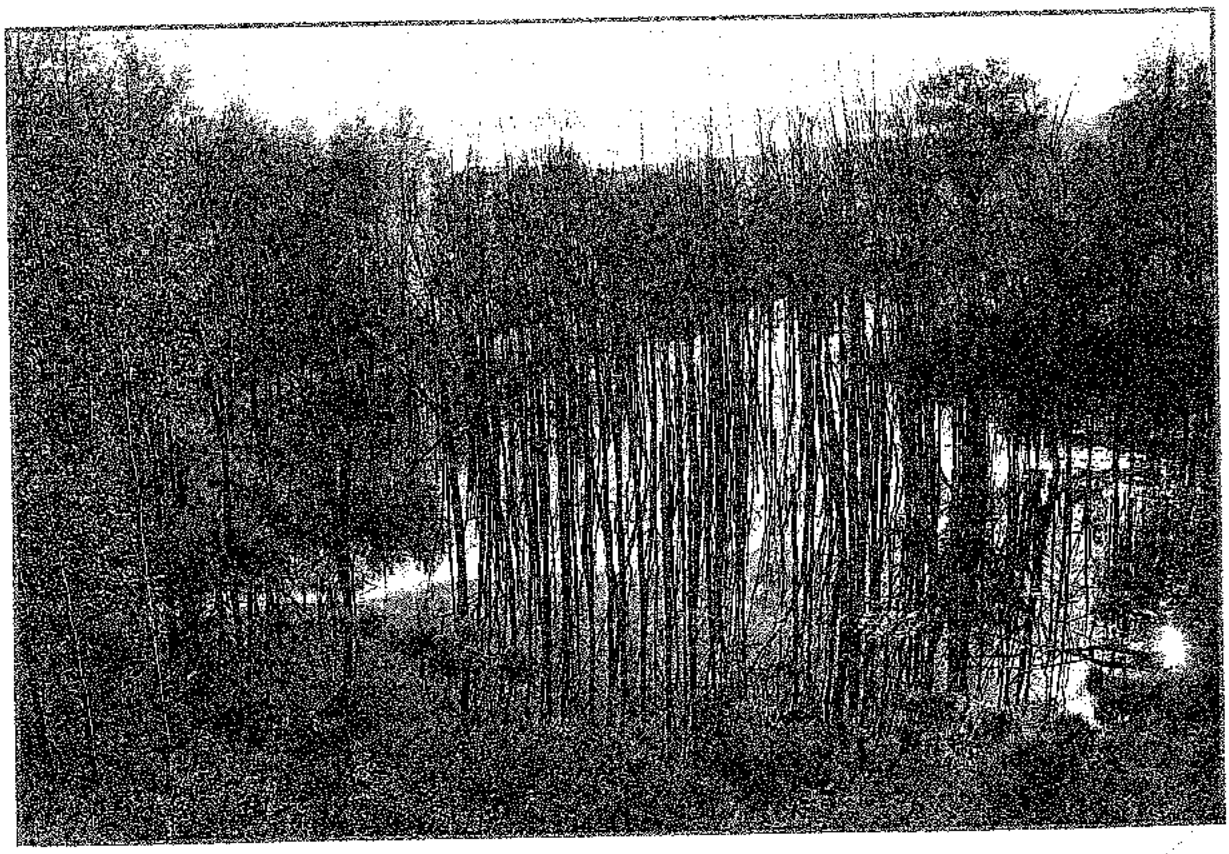
Great Lakes-St. Lawrence Lowlands which comprise only 14% of Canada's area. Canada's two largest cities, Toronto and Montréal, are located here along with 70% of the country's manufacturing industries. Wouldn't you agree that the Great Lakes-St. Lawrence Lowlands could be called "Canada's industrial and **urban** heartland?"

Hudson Bay-Arctic Lowlands

Around the southwestern shore of Hudson Bay and James Bay is a very flat, low area covered by swampy forest (Fig. 11-9). The waters of Hudson Bay covered much of this lowland at the end of the last Ice Age. Known as the Hudson Bay Lowlands, this region has a layer of sedimentary rock which rests on top of the ancient rock of the Shield.

The Arctic Lowlands are made up of a series of islands located in Canada's far north, and have a gently rolling landscape. The harsh climate does not permit farming; the ground remains frozen most of the year. However, the Paleozoic sedimentary rock, from which the Lowlands are formed, contains **lignite** (a form of coal), oil, and natural gas deposits.

▽ **Fig. 11-9** *The Hudson Bay Lowlands*



QUESTIONS

CHECK YOUR UNDERSTANDING

1. How was the bedrock of the lowlands formed?
2. a) How thick is the bedrock in the Interior Plains and why is it so thick?
   b) Why are the ancient coral reefs of the Interior Plains important today?
3. a) Describe the topography of the Interior Plains as you would see it if you were driving across the region from west to east on the Trans-Canada Highway.
   b) Explain the major processes responsible for what you see.
4. Parts of the southern portion of the Interior Plains are often called Canada's "bread-basket." Why?
5. What separates the Great Lakes Lowlands from the St. Lawrence Lowlands? Where does this occur and what is the appearance of this area?
6. Copy the paragraph below into your notebook. Wherever there is an asterisk (*) insert the correct word from this list:

   sedimentary, Escarpment, rift, soft, south, faults, erosion, glaciation, Great Lakes

   To the * of the Canadian Shield is the Great Lakes-St. Lawrence Lowlands. Like the Interior Plains, these lowlands are underlain by * rock. The St. Lawrence Lowlands were created when land between two * collapsed creating a * valley. The landscape of the Great Lakes Lowlands is largely the result of *. The * were carved out by glaciers. The Niagara * is the biggest single feature of the lowlands.
7. a) Describe the characteristics of the Hudson Bay and Arctic lowlands.
   b) What minerals are important in the Arctic Lowlands? How did they get there?

ANALYZE AND APPLY

8. a) Mark the three different lowland regions on the outline map of Canada on which you drew the Shield.
   b) Label the lowlands regions on your map.
   c) On your map, label the major cities (populations of 100 000 and over) in each region. Save your map for another activity later in this chapter.
   d) How many of Canada's major cities are found in the lowlands?
   e) Compare the number of major cities in the lowlands with the number found in the Canadian Shield earlier in this chapter. Which region has more? Why?
9. Examine the photographs of each of the lowland regions (Fig. 11-5, 11-6, and 11-9). Describe the differences you see.
10. a) Name the four lakes in Manitoba and the five Great Lakes which are remnants of glacial lakes.
    b) Why are these lakes smaller than they were in the glacial period? Why did the lakes not disappear completely?

◁ **Fig. 11-10**
The Appalachians

THE HIGHLANDS

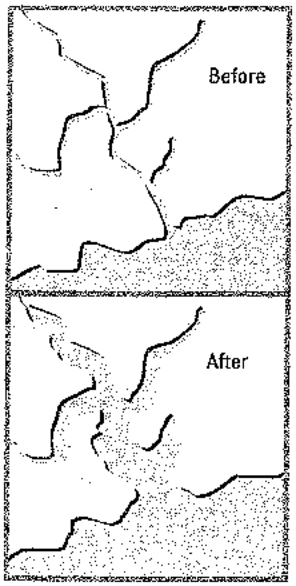
Canada's three highland areas lie to the east, north, and west of the Shield and lowlands areas. Each of these three striking, mountainous areas — the Appalachians, the Innuitians, and the Western Cordillera — has a different geological history and appearance (Fig. 11-1).

Appalachian Mountains

The Appalachian Mountains stretch from the state of Georgia in the southern United States through the Maritimes to Newfoundland in the north. They are the oldest highland region in Canada, and formed about 300 million years ago. Layers of sedimentary rock were uplifted and folded at the end of the Paleozoic era when North America collided with Europe and northern Africa during the formation of Pangaea. Rocks found in the Appalachians of Nova Scotia and Newfoundland are similar to rocks found in Wales and Scotland. The layers of sedimentary rock are rich in deposits of **non-metallic minerals** such as coal. Volcanic activity and faulting created igneous and metamorphic rock in certain areas of the Appalachians. **Plateaus** of this rock contain metallic minerals such as iron and zinc.

Millions of years of erosion have reduced the Appalachians' once jagged peaks to rolling mountains and hills (Fig. 11-10). In recent geologic times, glaciation has played a part in this erosion, grinding down the peaks and separating the hills and mountains with wide glacial valleys.

During the last Ice Age, the weight of the ice pressed the Appalachians down. As the land sank, and the ice melted, the small inlets along the east coast were flooded by the sea. The long bays that were created form a "drowned coastline" (Fig. 11-11). These long bays have provided deep harbours for ocean freighters, and some have become today's sites of major cities. Other settlement is located mainly in the fertile river valleys and along the seacoast.



△ **Fig. 11-11** *Formation of a "drowned coastline"*

Former river valleys that were drowned by rising sea levels form deep, irregular inlets.

Innuitian Mountains

The Innuitian Mountains stand like icy watch towers in Canada's far north. In some locations they measure over 2500 metres in height. Their present form was shaped in the middle of the Mesozoic era when the North American plate moved northward. The Innuitians contain igneous and metamorphic rocks, but for the most part are composed of sedimentary rock.

They are younger than the Appalachians, and so erosion has not had time to reduce them to rounded hills. They are also barren because trees can neither survive the extremely cold winter temperatures, nor grow during the short summer. Vast areas are covered by ice and permanent snow. The Innuitian Mountains resemble the Appalachians in composition and, as you might expect, contain similar types of minerals. The mineral resources have not been greatly exploited, however, because the region's remote location makes development too costly when cheaper alternatives exist further south.

remote, far away from where most Canadians live

Western Cordillera

The Western Cordillera stands along the western edge of Canada like a great wall: range after range of mountains separated by plateaus and valleys (Fig. 11-12). The great height and rugged appearance of these ranges tell us that they are geologically young. The collision of the North American and the Pacific plates is responsible for uplifting this region into several mountain ranges about 680 km wide. The heavier Pacific plate forced its way under the lighter North American plate causing much folding, faulting, and volcanic activity. The result was the Western Cordillera.

The mountains and valleys of the Western Cordillera run in a north-south direction. This presents an obstacle to transportation because main travel routes across the Cordillera must run in an east-west direction. There are only a few passes, or gaps, in the ranges of the cordillera which are low enough to allow highways and railways to cross over.

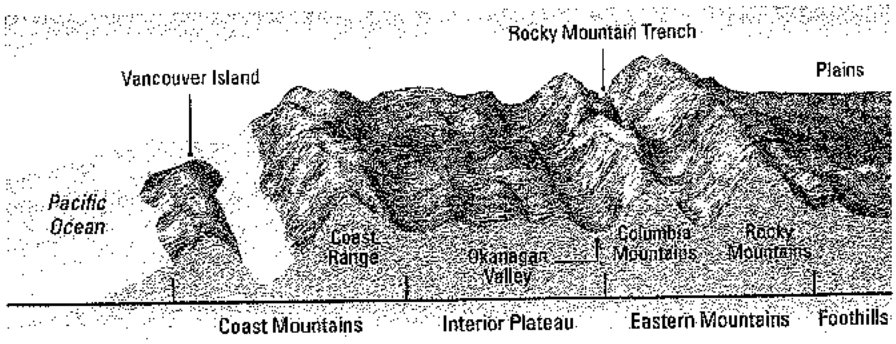
in an atlas, and list three major routes through the southern part of the Western Cordillera.

◁ **Fig. 11-12** *The Rocky Mountains in the Western Cordillera. The Rockies are the most easterly mountains in the Cordillera.*

Since it is so mountainous, the Cordillera is lightly populated. Most people live in the farming and mining towns located in the river valleys. Vancouver and Victoria, the largest cities in the Western Cordillera, are built on flat land in coastal locations. Towns such as Banff and Jasper thrive because of tourists who come to see the beautiful majesty of the mountains. The glaciers in the mountains of the Western Cordillera are the only remaining glaciers in Canada apart from those in the Arctic. These glaciers add to the beauty for which the Canadian West is famous.

Many people tend to use the name "Rocky Mountains" and "Western Cordillera" interchangeably. This is a mistake. There are three major divisions in the Western Cordillera. The Rocky Mountains and the Columbia Mountains, among others, make up the eastern mountains. The Interior Plateaus to the west of these ranges make up the second division. The Coast Mountains on the western edge of the Cordillera make up the third. Refer to Fig. 11-13 as you read about each division.

interchangeable, can be used in place of the other.



◁ **Fig. 11-13** *A profile of the Western Cordillera, from Vancouver to near Calgary*

EASTERN MOUNTAINS

The eastern division of the cordillera consists of two main mountain ranges — the Rocky and the Columbia Mountains — separated by a deep valley. On the east are Canada's youngest, and most famous mountains, the Rockies, formed about 65 million years ago. The Rocky Mountains are formed of folded and faulted sedimentary rock which contains many fossils and deposits of coal. Today, the Rockies stand as much as 4000 m above sea level.

The Rocky Mountain Trench is a deep valley separating the Rockies from the second main range, the Columbia Mountains. This valley was created by erosion along a zone of faults. It is only about 10 km wide, 1600 km long, and almost 2000 m lower than the mountains on either side.

On the western side of the Rocky Mountain Trench in southern British Columbia are three mountain ranges separated by trenches. Together they are known as the Columbia Mountains. At 3000 m, the Columbia Mountains are not as high as the Rockies but they are older. They are made of sedimentary rock but have many metamorphic **intrusions** containing a wide variety of metallic minerals. As a result, there is more mining in the Columbia Mountains than in the Rockies.

intrusion: molten rock injected between or through the layers of rock below the surface

INTERIOR PLATEAUS

In the centre of the Cordillera is a series of rugged plateaus between 1300 m and 2000 m in height among high hills and small mountains. The area is composed of metamorphic and igneous rocks due to past volcanic activity. It contains many valuable metallic minerals such as copper, gold, and zinc. The lava plateaus have been deeply cut by major rivers creating deep valleys that make transportation across them difficult. Glacial and river deposits have, however, made excellent farmland of many of the valleys. One of these is the Okanagan Valley.

COAST MOUNTAINS

Like the eastern mountains, the Coast Mountains are divided into two ranges separated by a deep trough. The Coast Mountain Range is on the mainland, while the Island Mountain Range is located on the offshore islands. The two ranges are separated by a deep trough that is occupied by an area of the Pacific Ocean.

trough: a long narrow depression

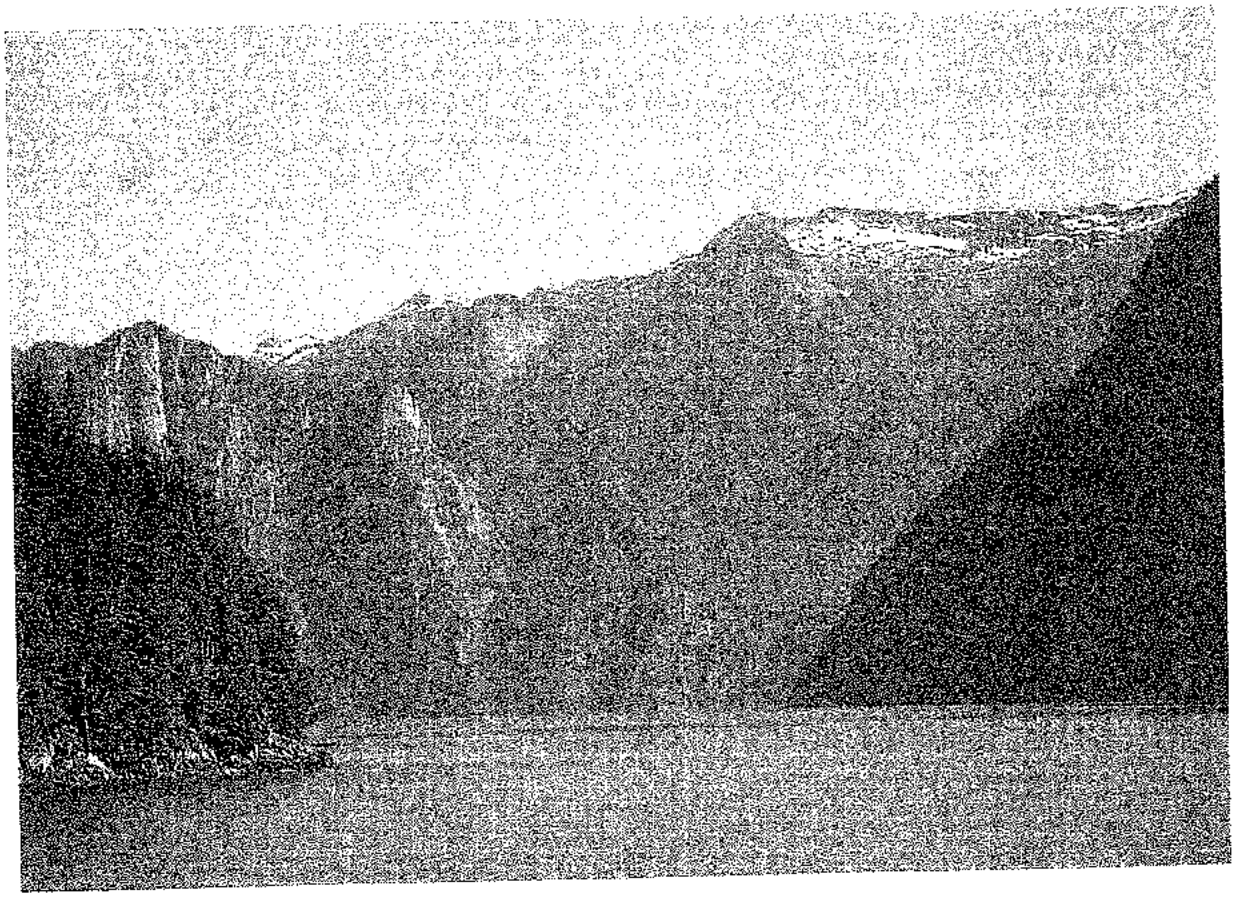
The Coast Mountains have been formed by the movement of the North American and Pacific plates. Since the heavier Pacific plate is sinking below the lighter North American plate, the pressure has caused magma to rise into the earth's crust where it has cooled to form igneous rock. The magma also melted some of the overlying crust to form metamorphic rock. The movement of the two plates against one another has uplifted this massive block of igneous and metamorphic rock to form the Coast Mountains.

The continuing movement of the North American and the Pacific plates in this area makes the West Coast of Canada the most active earthquake region in the country. The plates are moving relative to one another at speeds of 2 cm to 10 cm per year. In the past 70 years, the Geological Survey of Canada has recorded more than 100 earthquakes of magnitude 5 or greater under the Pacific Ocean west of Vancouver Island. These are large enough to cause damage if they occur close to shore. In 1949, an earthquake of magnitude 8.1 struck the Queen Charlotte Islands. If such an earthquake were to occur near a major city, the result would be almost total destruction and tremendous loss of life.

The largest earthquakes ever measured had Richter magnitudes near 8.5

During the last Ice Age, glaciers occupied many coastal valleys. These glaciers eroded the valleys below sea level. When the ice melted, these valleys were flooded by the sea, and became long narrow inlets called **fiords**. The steep sides of these fiords and the towering mountains create spectacular scenery that today attracts thousands of tourists (Fig. 11-14). These tourists, however, must travel by boat or seaplane because there are few roads along the rugged coast of British Columbia. Roads are not very practical because of the long distances around the fiords.

▽ **Fig. 11-14** *A fiord in the Coast Mountains of British Columbia*



IN CLOSING...

The movement of the earth's plates, and the resulting folding, faulting, and volcanic activity, have combined with the forces of erosion and glaciation to create a variety of landscapes that affect the way we live.

"A core of ancient rock, surrounded by lowlands and then highlands on three sides." This may be a simple description, but it summarizes the diversity of Canada's physical landforms.

CHECK YOUR UNDERSTANDING

1. Use your own words to describe how the Appalachian Mountains were formed.
2. Why does the Appalachian region have many excellent harbours?
3. a) Describe the composition and appearance of the Innuitian Mountains.
   b) Why has this region not been developed as much as other regions?
4. a) How were the fiords of British Columbia created?
   b) What effect do the fiords have on land transportation along the coast?
5. Explain why the West Coast of Canada has so many earthquakes.

ANALYZE AND APPLY

6. a) Mark the highland regions on the outline map of Canada that you used for the Shield and lowlands.
   b) Name each region.
   c) Locate the major cities (population 100 000 and over) in each highland region.
   d) Compare the number of major cities in these highland regions with the number in the lowlands and the Shield. Why does this pattern exist?

▽ **Fig. 11-15**

Distance from Vancouver on profile (cm)	Elevation at this point (m)
0.5	350
1.0	1500
1.5	2700
2.5	1800
3.5	2500
4.0	1400
6.0	1200
7.5	1400
8.0	1600
9.0	2200
10.5	3200
11.5	3300
12.0	1000
12.5	2800
13.0	3500
14.0	1800
15.0	1050

7. Examine the photo of the Appalachians (Fig. 11-10) and the photo of the Western Cordillera (Fig.11-12). Which mountains are older? How can you tell?
8. Draw a profile of the Western Cordillera according to the following instructions.
   a) On a piece of graph paper draw a horizontal line 15 cm long. Label the left end of the line Vancouver and the right end Calgary.

Division	Formation Process	Rock Type	Appearance
Eastern Mountains Rocky Mountains Rocky Mountain Trench Columbia Mountains			
Interior Plateaus			
Coast Mountains			

△ Fig. 11-16

Mountain Range	Name of Highest Mountain	Height of Highest Mountain
Rocky Mountains		
Coast Mountains		
St. Elias Mountains		
Appalachians (Québec)		

△ Fig. 11-17

b) Draw a vertical scale on the left showing elevations from 0 to 3500 m. The vertical scale should be 1 cm = 700 m.

c) Put dots at the elevations and distances provided in Fig. 11-15. Once all the dots have been placed, join the dots.

d) Label the following features on your profile:

Rocky Mountains, Rocky Mountain Trench, Columbia Mountains, Interior Plateaus, Coast Mountains

e) In your notebook, compare the three major divisions of the Western Cordillera using an organizer like Fig. 11-16.

f) What problems might exist in this region for farming and transportation?

9. a) Construct an organizer in your notebook similar to Fig. 11-17. Complete the information with the help of an atlas.

b) Of these mountains, which one is the highest in Canada?

c) Relate the height of the highest and lowest of these mountains to their age.

THINK AND COMMUNICATE

10. Review the material in this chapter and discuss the following quotation:

"Canada is an east-west country trying to survive in a north-south continent."