

EXPLORING PHYSICAL GEOGRAPHY

Investigating Landforms, Water, Climate, and Ecosystems



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Aligned with the Ontario Curriculum



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“Physical geography helps us understand the natural processes that shape our world.”

CHAPTER 1: GEOGRAPHIC FOUNDATIONS

Figure 1.1

Traditional Environmental Knowledge Across Turtle Island

Indigenous Peoples have long observed and understood the land, water, plants, animals, weather, and seasonal change. This knowledge is place-based, passed down through generations, and connected to responsibility and respect.



KEY IDEA

People can learn about places by observing patterns and relationships in the environment.

Sources: Government of Canada imagery and public-domain reference materials.

TASK: Discuss the following questions with a partner or small group. There are no right or wrong answers. Use the image to support your ideas.

1. What patterns do you notice in the land, water, plants, and animals shown in the figure?
2. Why might people need to understand seasonal changes, waterways, and animal movements in order to live successfully in a particular place?
3. Which parts of the environment appear to be connected to one another? Give examples from the figure.
4. How might knowledge of the land help people make decisions about travel, food gathering, fishing, hunting, or settlement?
5. Why do you think people who carefully observe a place over many years might understand that place differently than someone who only visits it briefly?
6. Imagine you were responsible for helping a community survive in this environment. What observations would be most important for you to make throughout the year?

Record one idea from your discussion in your notebook.

For thousands of years, people have used careful observation to better understand places and environments. Modern geographers continue this tradition. However, observation alone is not always enough to explain geographic patterns. Geographers must also identify the factors that influence those

patterns. These factors are known as spatial variables. In the next section, you will learn how geographers use spatial variables to explain why places develop and change.

KEY IDEA: Careful observation helps people recognize patterns and understand relationships in the environment.

BIG IDEA: Geography is the study of interactions among spatial variables.

CENTRAL QUESTION: How do geographers investigate and explain physical patterns in the world around them?

GEOGRAPHIC FOCUS: Canada contains diverse landforms, waterways, climates, ecosystems, and natural resources. Geographers study these physical features to understand why geographic patterns exist and how physical environments change over time. By observing patterns, gathering evidence, and examining relationships among spatial variables, geographers develop explanations for the physical and human characteristics of places.

SECTION 1: INTRODUCTION

Why do forests grow in some regions but not others?

Why are large lakes found in certain parts of Canada?

Why are some regions rich in minerals while others support agriculture?

Why do physical features vary so dramatically from one part of Canada to another?

Although these questions involve different parts of the natural world, geographers investigate them using the same way of thinking.

The world around us is filled with patterns. Mountains, rivers, forests, grasslands, wetlands, and coastlines are not randomly distributed. Each pattern develops through interactions among many spatial variables such as climate, elevation, latitude, water availability, vegetation, and geology. Geography helps us understand these relationships. Geographers observe patterns, ask questions, gather

evidence, and explain how different variables interact to shape places and environments. In this chapter, you will explore the concepts and tools used by geographers. These ideas will provide a foundation for the rest of the textbook and help you investigate Canada's physical geography.

Canadian Ecosystems and Natural Resources

1 ECOSYSTEM AND VEGETATION REGIONS



	Arctic Tundra	Treeless Arctic landscape of mosses, lichens, and low shrubs.
	Boreal Forest	Vast evergreen forest of spruce, pine, and fir.
	Mixed Forest	Deciduous and coniferous trees, common in southern Canada.
	Grasslands / Prairies	Grassy plains with few trees; important for agriculture.
	Mountain Forest	Forests on mountain slopes; varies with elevation.
	Pacific Coastal Forest	Lush, wet forests along British Columbia's coast.

2 NATURAL RESOURCE REGIONS



	Forestry	Forest resources across the boreal and coastal regions support timber and paper.
	Agriculture	Fertile soils in the Prairies and southern regions support farming.
	Minerals	Canada's Shield is rich in minerals such as iron, nickel, copper, gold, and diamonds.
	Oil and Natural Gas	Major reserves in Western Canada and offshore regions.
	Hydroelectric Resources	Abundant water resources provide clean hydroelectric power.
	Fisheries	Rich marine and freshwater fisheries along coasts and in inland waters.



Ecosystem regions and natural resources are not distributed randomly across Canada. Geographers investigate how climate, geology, landforms, water availability, and other spatial variables interact to create these patterns.

TASK: Think About It

Examine Figure 1.1 carefully before continuing.

1. Where do you see large forested regions in Canada?
2. Where do major agricultural regions appear?
3. Where are important mineral and energy resources located?
4. Do you notice any relationships between ecosystems and natural resources?
5. Why might some natural resources be concentrated in particular regions?
6. What physical factors might help explain these patterns?
7. Are the ecosystems and resources distributed randomly across Canada, or do they appear to follow identifiable patterns?

Record your answers in your notebook.

As you work through this chapter, consider how geographers use observations such as these to ask questions, identify patterns, and develop explanations.

SECTION 2: SPATIAL VARIABLES

Geographers seek to explain why geographic patterns exist. To do this, they study spatial variables. A spatial variable is any geographic characteristic that differs from one location to another and helps influence the patterns we observe in the world around us. Some spatial variables are physical. Others are human. Both can affect how places develop and change. For example, a forest may grow in one region but not another because the two areas differ in climate, temperature, precipitation, soil, and elevation. These physical spatial variables help create the conditions necessary for specific types of vegetation.

Similarly, a city may develop in a particular location because of transportation routes, access to resources, employment opportunities, and population growth. These are examples of human spatial variables.

Geographers rarely study only one variable at a time. Most geographic patterns are the result of several variables interacting with one another. Understanding spatial variables helps geographers move beyond simple observation and begin explaining why patterns occur.

Physical Spatial Variables: Physical spatial variables occur naturally within the environment.

Climate affects what plants can grow in an area. Elevation influences temperature and weather patterns. Water availability helps determine where ecosystems develop and where people can live. Canada's physical geography provides excellent examples of these interactions. The Arctic tundra, the Prairies, the Rocky Mountains, and the Great Lakes region all display unique combinations of physical spatial variables.

Human Spatial Variables: Human spatial variables result from human activities and decisions.

People build roads, create transportation systems, construct cities, extract resources, and modify landscapes. These actions create geographic patterns that geographers can observe and investigate. Physical and human spatial variables often influence one another. Fertile soil and favourable climate conditions support agriculture, while agricultural activities can alter natural environments. Access to water can encourage settlement, while growing populations may affect local ecosystems.

Interactions Create Patterns

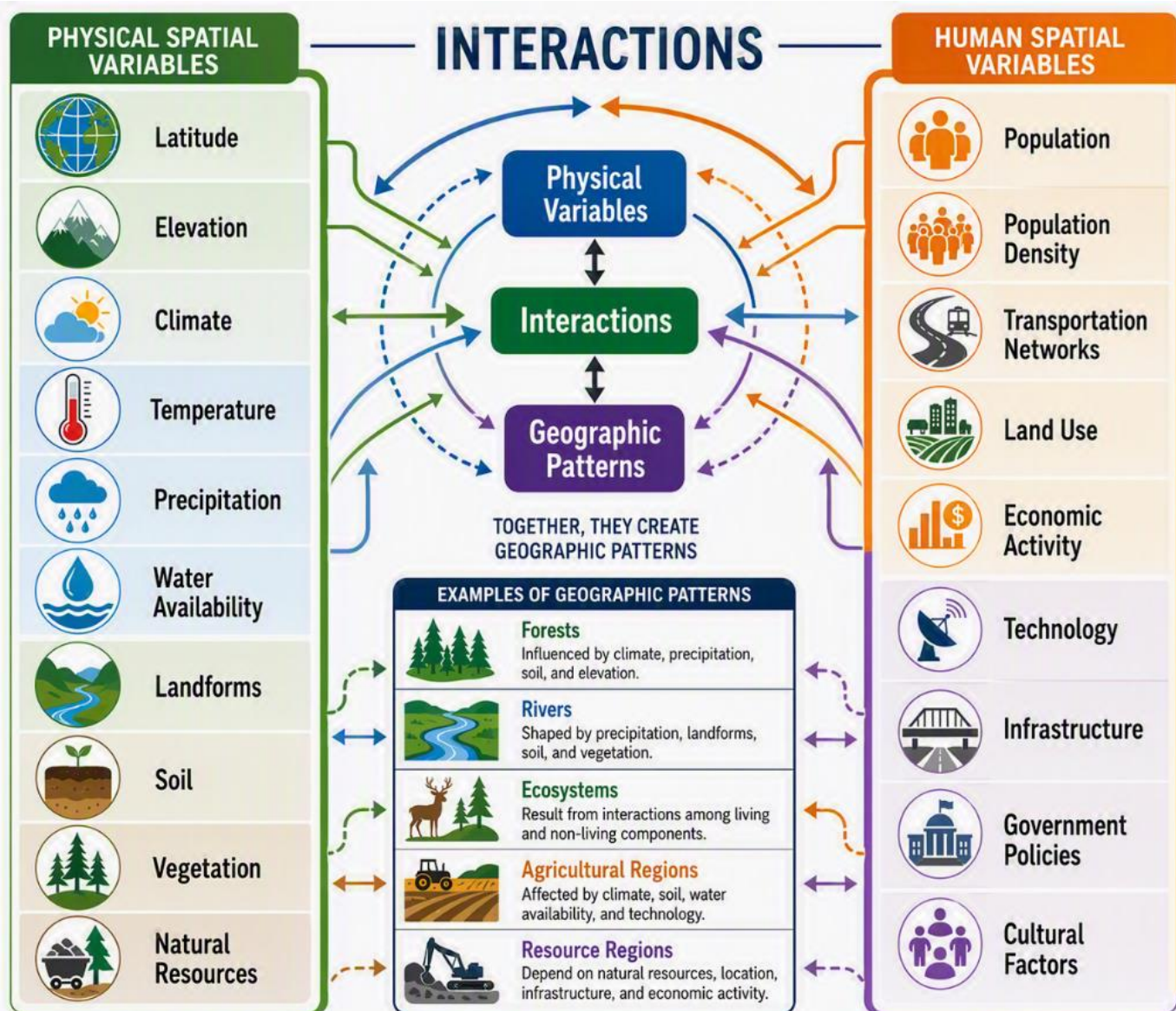
One of the most important ideas in geography is that spatial variables interact. A single variable rarely explains an entire geographic pattern. Consider a forest ecosystem. Its location may be influenced by climate, precipitation, soil quality, elevation, and access to water. No single factor alone explains the entire pattern. The same principle applies to many geographic questions investigated by geographers.

KEY IDEA: Geographic patterns emerge from interactions among spatial variables.

TASK: Imagine you are investigating why a large forest exists in one region of Canada.

1. Which physical spatial variables would you examine?
2. Would a single variable provide a complete explanation, or would several variables need to be considered together?

Record your answers in your notebook.



Geographic patterns emerge from interactions among spatial variables.



SECTION 3: PHYSICAL AND HUMAN GEOGRAPHY

Geography is a broad field of study. To better understand the world, geographers often organize their investigations into two major areas: physical geography and human geography. Although these areas focus on different aspects of the world, they are closely connected. In many situations, physical and human geography influence one another. Physical Geography focuses on the natural features and processes found on Earth.

FIGURE 1.3

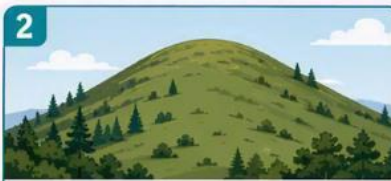
COMMON ONTARIO LANDFORMS

Physical geographers study landforms because they influence ecosystems, transportation, settlement patterns, natural resources, and human activities.



1 Valley

A low area between higher areas of land.



2 Hill

A raised area of land with a rounded summit.



3 Plateau

A broad area of elevated flat land.



4 Mountain

A high elevation landform with steep slopes.



5 Escarpment

A long steep slope separating different elevations.



6 Plain

A large area of relatively flat land.



7 Beach

A shoreline shaped by waves and water movement.



8 Sand Dune

A hill of sand formed by wind.



9 Wetland

Land saturated with water for much of the year.



10 River

A flowing body of freshwater.



11 Lake

A large inland body of water.



12 Waterfall

A location where water drops suddenly over rock.



KEY GEOGRAPHIC IDEA

Landforms help geographers understand how physical processes shape Earth's surface. They also influence ecosystems, transportation routes, natural resources, and human activities.

Landforms are natural features found on Earth's surface. Ontario contains a variety of landforms that help shape ecosystems, transportation routes, settlement patterns, natural resources, and human activities.

Physical geographers study:

- Landforms
- Water systems
- Climate
- Weather
- Ecosystems
- Vegetation
- Soil
- Natural hazards

Physical geographers investigate how natural processes shape the environment. For example, they may study how rivers erode valleys, how glaciers reshape landscapes, how weather affects ecosystems, or how climate influences vegetation patterns.

Throughout this textbook, you will frequently investigate questions related to physical geography. Understanding Canada's physical geography helps explain many of the geographic patterns visible across the country.

Consider the Niagara Escarpment. Its location, elevation, geology, and climate influence the surrounding environment. These physical variables help explain why certain ecosystems develop in the region and why human activities differ from those found elsewhere in Ontario.

Human Geography

Human geography focuses on people and the ways they interact with places and environments. Human geographers study:

- Population
- Communities
- Transportation
- Land use

- Economic activities
- Culture
- Resources
- Urban development

Human geographers investigate how people use space, modify environments, and create geographic patterns. A human geographer might study why cities develop where they do, why transportation routes follow particular paths, or how populations change over time. Although this textbook focuses primarily on physical geography, human geography remains important because people are part of geographic systems.

Geography Connections

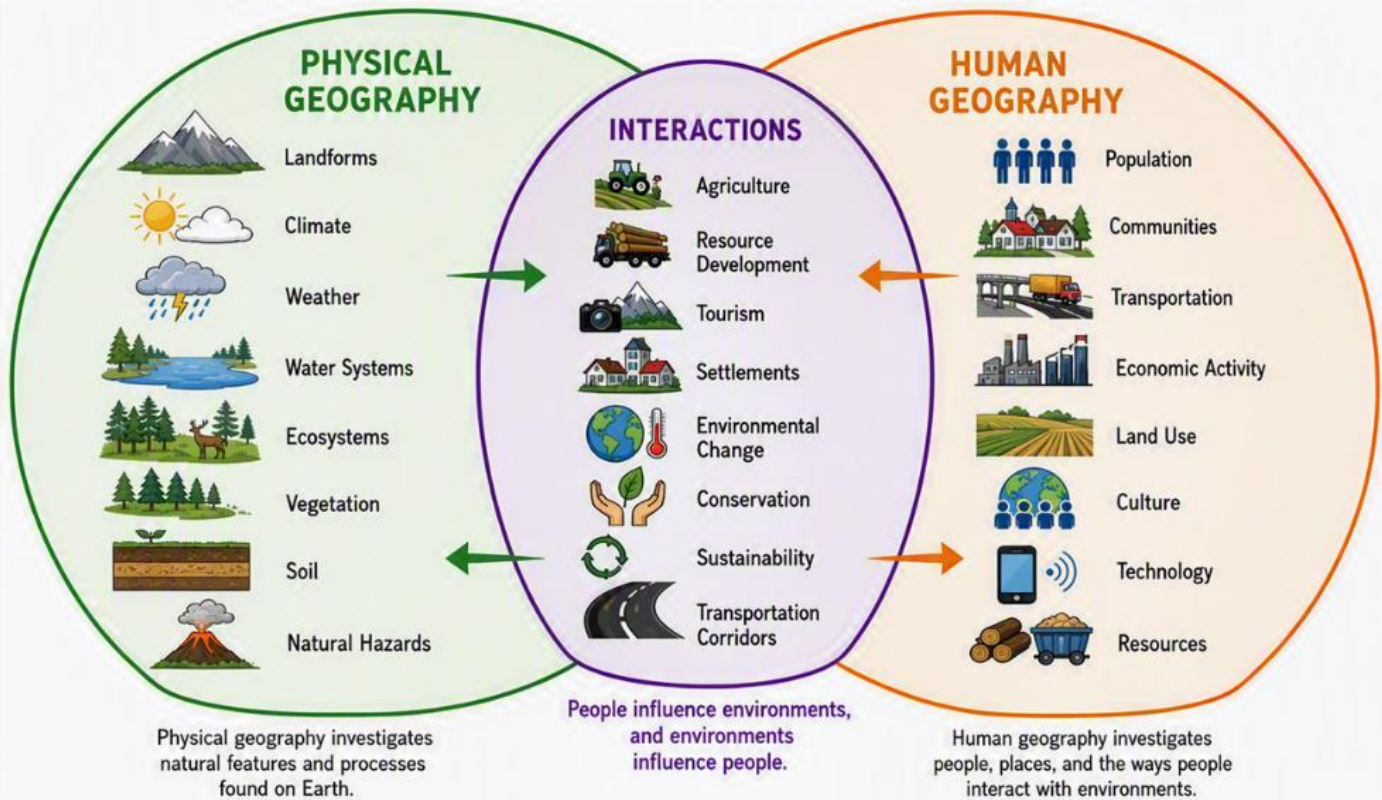
Physical and human geography are closely connected. A major river may provide drinking water, transportation routes, hydroelectric power, recreation opportunities, and habitat for living things. Mountain regions may influence climate patterns while also affecting transportation, tourism, and settlement. Fertile soils support agriculture, while agricultural practices can influence local environments. In each example, physical and human spatial variables interact to create observable geographic patterns.

KEY IDEA: Physical and human geography are interconnected because people and environments influence one another.

FIGURE 1.4

PHYSICAL GEOGRAPHY AND HUMAN GEOGRAPHY

Geographers study both natural systems and human systems because they continuously influence one another.



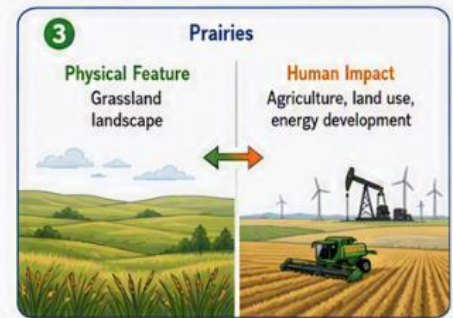
GEOGRAPHY IN ACTION



The escarpment shapes where people live and travel, and people use and protect this natural feature.



The lakes provide resources and routes for people, and people depend on and affect the health of the lakes.



The grasslands support farming and energy, and human activities shape the landscape.

Figure 1.4: Physical geography investigates natural features and processes. Human geography investigates people, communities, and human activities. Geographers often study both because physical and human systems interact continuously.

TASK: Choose one physical feature found in your community or region.

Examples might include:

- A river
- A lake
- A forest
- A wetland
- A valley
- A hill or escarpment

1. How might this physical feature influence people living nearby?
2. Can you identify any ways that people have also affected that environment?
3. Geographers often investigate both types of interactions when studying a place.

Record your answers in your notebook.

SECTION 4: MAPS AND GEOGRAPHIC REPRESENTATIONS

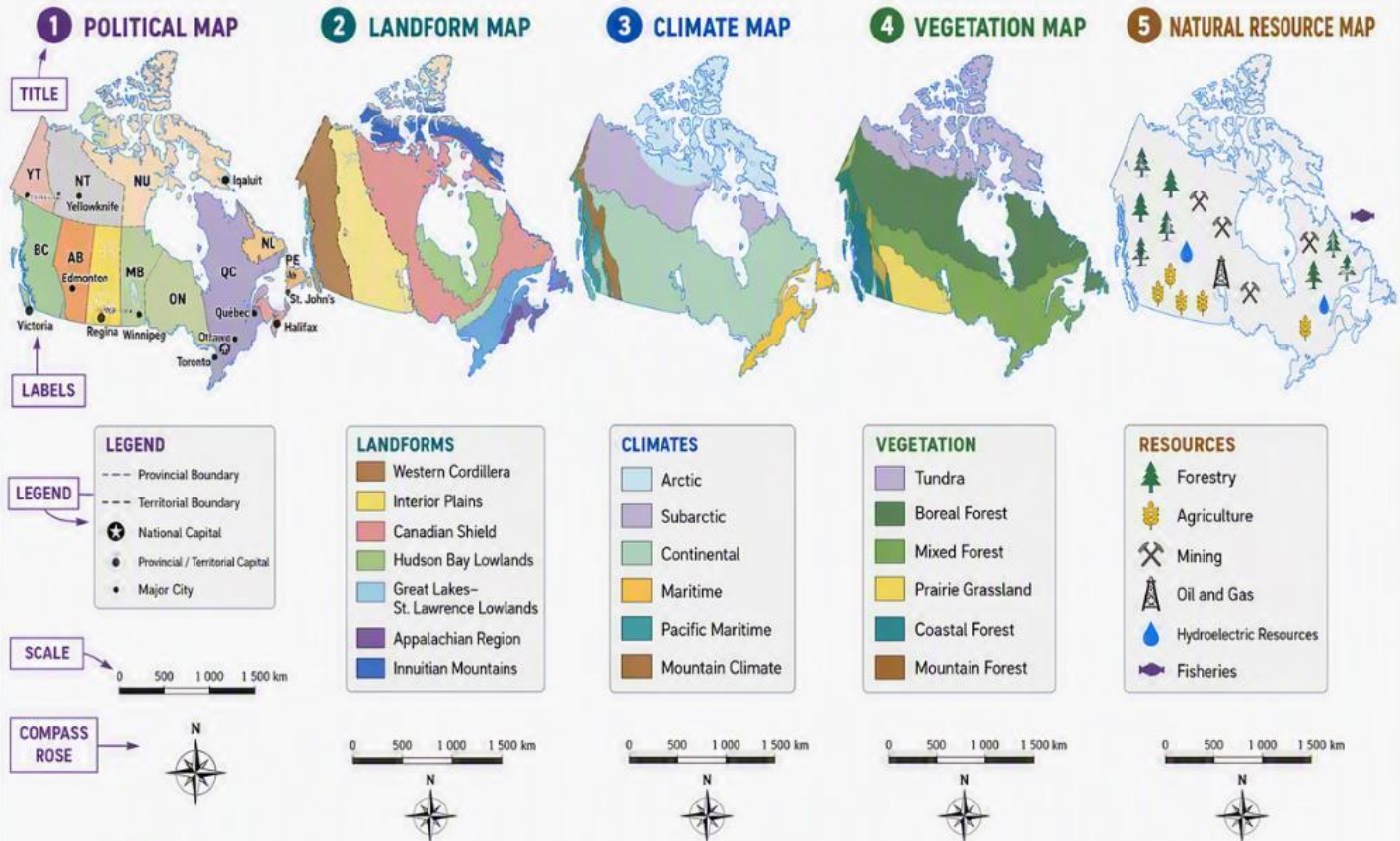
Geographers study places that are often too large, too distant, or too complex to observe directly. To better understand these places, they use maps and other geographic representations. Maps are among the most important tools used in geography. A map is a simplified representation of a real place. Maps help geographers organize information, identify patterns, compare locations, and communicate geographic ideas. Maps are not reality. They are representations of reality. Because no map can show everything, cartographers must decide which information is most important for a particular purpose.

Different Maps Show Different Spatial Variables. Different maps emphasize different spatial variables. A landform map highlights features such as mountains, plains, plateaus, and valleys. A climate map highlights temperature and precipitation patterns. A vegetation map shows the distribution of ecosystems and natural vegetation regions. A natural resource map highlights the distribution of forests, minerals, energy resources, and agricultural regions.

Although these maps may represent the same area, each one emphasizes different geographic information. By comparing multiple maps, geographers gain a more complete understanding of a place. Figure 1.5 Compares different kinds of maps for Canada.

FIGURE 1.5**MAPS HIGHLIGHT DIFFERENT SPATIAL VARIABLES**

Geographers compare multiple maps because each map highlights different spatial variables and reveals different geographic patterns.

**THE SAME PLACE, DIFFERENT INFORMATION**

Each map represents Canada, but each emphasizes different spatial variables. By comparing multiple maps, geographers identify patterns and develop explanations for why places are the way they are.

**KEY GEOGRAPHIC IDEA**

Different maps reveal different spatial variables. By comparing maps, geographers identify patterns and explain geographic relationships.



Geographic Representations: Maps are only one type of geographic representation.

GEOGRAPHIC REPRESENTATIONS IN THE REAL WORLD

Imagine that you have been asked to investigate a place you have never visited. You know very little about the area, yet you need to understand what it looks like, how people use it, and what geographic patterns might exist there. Could a single map provide all of the information you need?

Probably not.

A road map might help you locate communities and transportation routes, but it would tell you very little about forests, climate, or population patterns. An aerial photograph would show what the landscape looks like from above, but it might not explain how temperature, precipitation, or economic activity vary across the region. Every geographic representation provides useful information, but each reveals only part of the larger picture.

For this reason, geographers use many different types of geographic representations. Maps, aerial photographs, satellite imagery, climate graphs, diagrams, cross-sections, models, and Geographic Information Systems (GIS) all help geographers investigate places and analyze geographic patterns. By combining multiple sources of information, geographers develop a deeper and more complete understanding of the world around them.

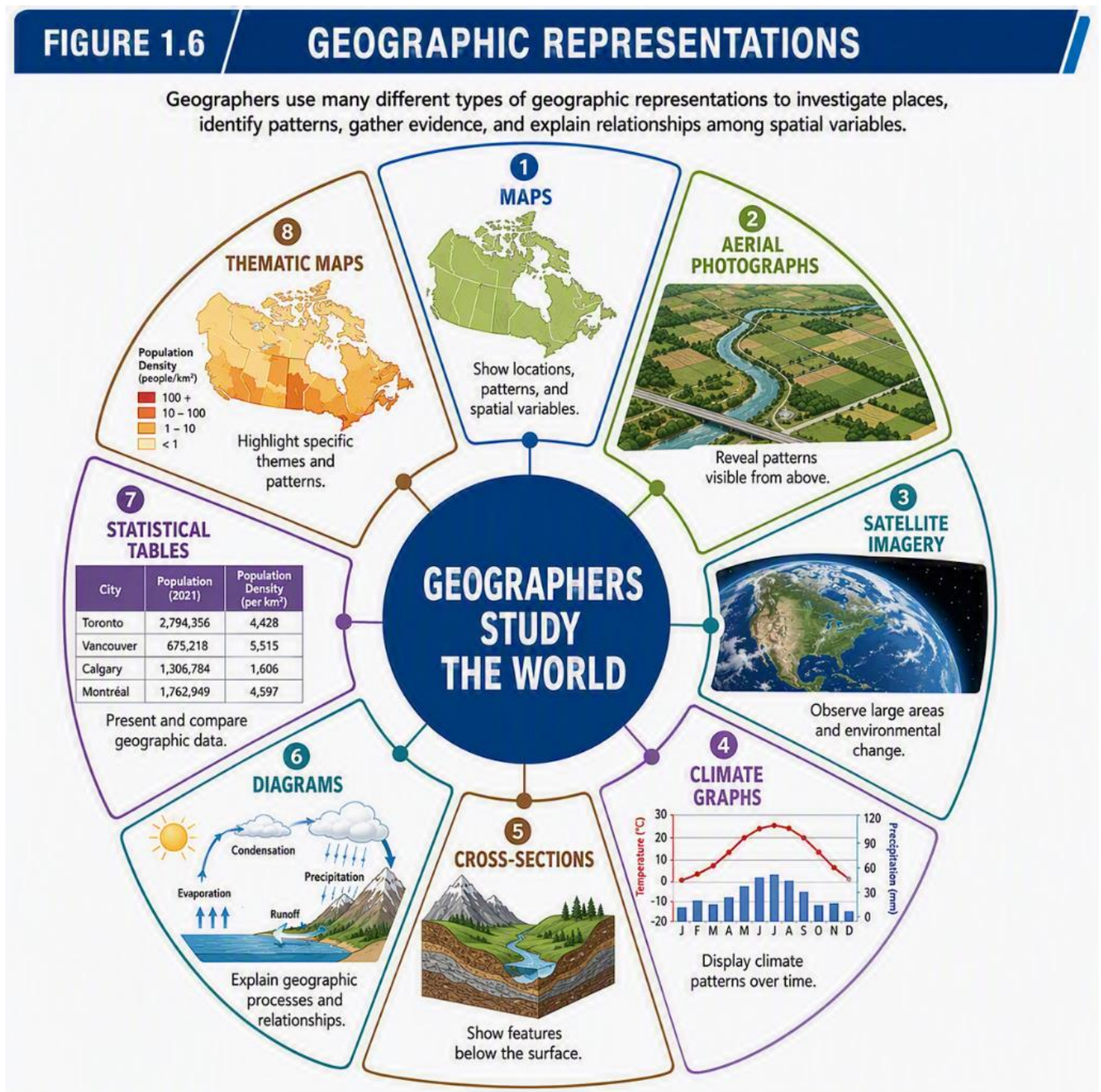
Geographers are not the only people who rely on these tools. City planners use maps, photographs, and population data when deciding where roads, parks, schools, and housing developments should be located. Environmental scientists use satellite imagery and climate data to monitor ecosystems and study environmental change. News organizations often use maps, graphs, and satellite images to help people understand natural disasters, severe weather events, and major world events.

Businesses also rely on geographic representations. A company deciding where to build a new store may study transportation routes, population density, land use patterns, and nearby services before making a decision. Governments use geographic information to manage natural resources, improve transportation systems, protect important habitats, and plan for future growth.

Each of these examples illustrates an important geographic principle: no single representation tells the whole story. Different geographic representations reveal different kinds of information. A map may identify a pattern, a photograph may provide visual evidence, a graph may reveal a trend, and a GIS system may help identify relationships that would otherwise be difficult to recognize.

As you examine the figure below, think about the kinds of information provided by each geographic representation. Consider how these different tools work together to help geographers answer questions, investigate patterns, and explain relationships among spatial variables.

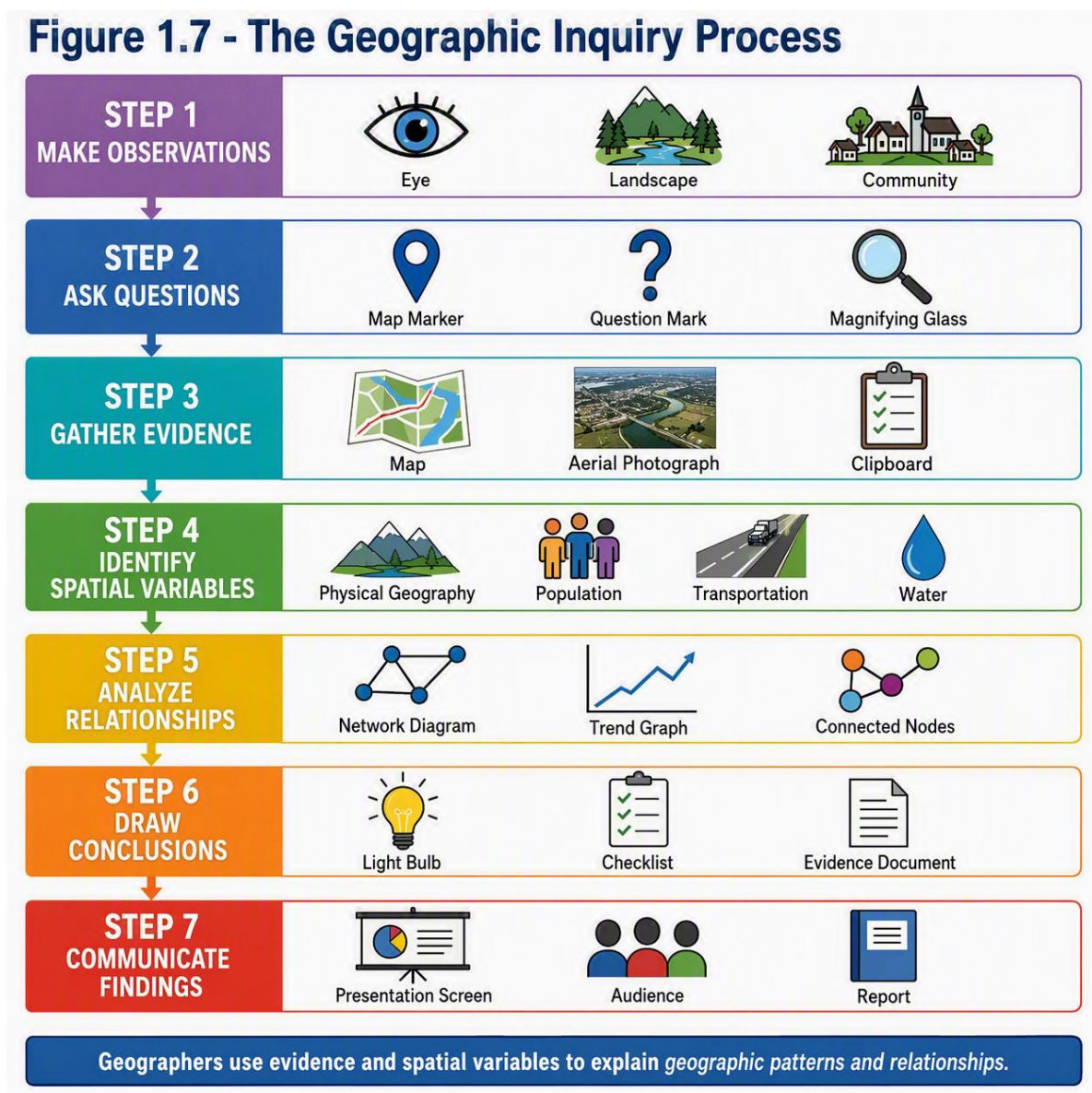
KEY IDEA: Geographers use many different geographic representations because each one reveals different information about a place or geographic pattern.



SECTION 5: GEOGRAPHIC INQUIRY AND THE FIVE THEMES OF GEOGRAPHY

Geographers use a structured process to explain the patterns they observe. Rather than relying on guesses, they gather evidence, identify relationships, and develop explanations that can be supported by facts.

The geographic inquiry process helps geographers move from simple observations to deeper understanding. Whether investigating forests, climate regions, communities, transportation systems, or natural resources, geographers use a consistent series of steps to guide their thinking and ensure that conclusions are supported by evidence. The figure below illustrates the inquiry process used by geographers to investigate and explain geographic patterns.



THE FIVE THEMES OF GEOGRAPHIC INQUIRY

Geographers often investigate places by asking a series of connected questions. Consider the area surrounding Ancaster Creek and Sherman Falls in Hamilton. Today, many people visit the area for hiking, sightseeing, and recreation. Long before it became a popular destination, however, the same area attracted settlers for very different reasons. The waterfall and creek provided a dependable source of moving water. Water power helped operate mills that supported early settlement and economic activity. Roads developed nearby, businesses emerged, and a community gradually formed.

THINK ABOUT IT

Before studying the example below, consider the following questions.

1. Which physical features of the landscape appear most important in this area? Consider features such as elevation, water, vegetation, and landforms.
2. How might the Niagara Escarpment, waterfalls, and creek systems influence the natural environment of the region?
3. Which physical spatial variables appear to have played the greatest role in creating the geographic patterns visible in this area?
4. How might people have adapted to or benefited from the physical features visible in this landscape?

Discuss your ideas with a partner or small group. As you examine the worked example below, consider how geographers use evidence to answer these questions.

To help answer questions such as these, geographers often use a framework called the Five Themes of Geography. You can see that framework in action in the figure below.

FIGURE 1.8

INVESTIGATING ANCASTER THROUGH THE FIVE THEMES OF GEOGRAPHY

Geographers use the Five Themes of Geography to organize observations, investigate physical patterns, and understand how people interact with their environment.



Figure 1.8: Investigating Ancaster Through the Five Themes of Geography: The Five Themes of Geography help geographers organize observations, identify patterns, and investigate relationships among spatial variables.

In the Ancaster example, geographers might examine:

- Location — Where is the waterfall and settlement located?
- Place — What physical and human features make this area unique?
- Human-Environment Interaction — How did people use the waterfall and creek?
- Movement — How did people, goods, and information move through the area?
- Region — What characteristics does this area share with the Niagara Escarpment region?

Each theme helps geographers view the same place from a different perspective. Together, the Five Themes provide a powerful framework for investigating geographic questions. As you continue studying geography, you will encounter these themes again and again.

In Grade 8 Human Geography, the Five Themes become an important tool for investigating communities, transportation systems, population patterns, and other human geographic issues.

KEY IDEA: The Five Themes of Geography help geographers organize information and investigate relationships among spatial variables.

TASK: THINK LIKE A GEOGRAPHER: Try applying the Five Themes yourself.

Study the map and aerial photograph below.

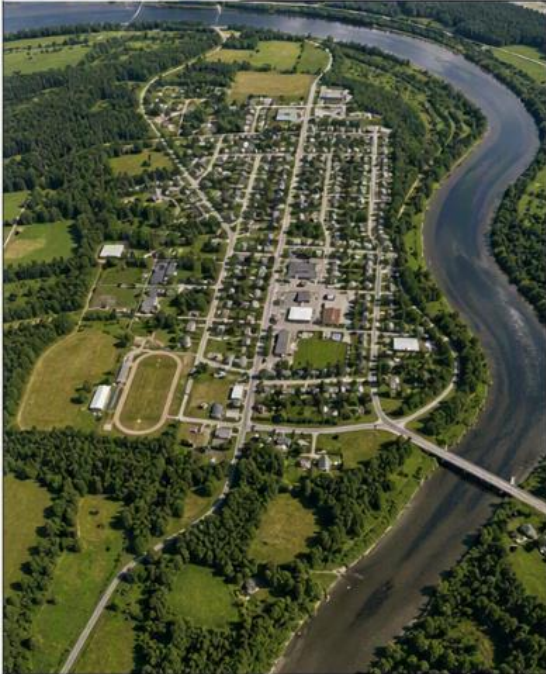
Respond to each of the questions in your notebook.

FIGURE 1.9

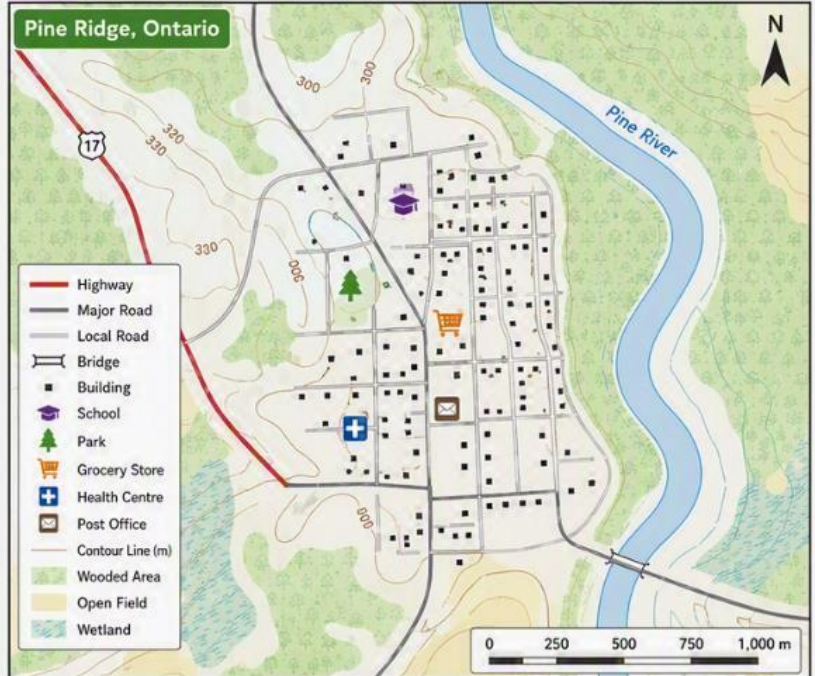
APPLYING THE FIVE THEMES OF GEOGRAPHY

Use the evidence in the aerial photograph and map to investigate this community.

AERIAL PHOTOGRAPH



MAP



TASK: APPLY THE FIVE THEMES OF GEOGRAPHY

Use the aerial photograph and map of Pine Ridge, Ontario to answer the questions below.

1 Location

Where is Pine Ridge located? Use evidence from the map.

2 Place

What are three characteristics that describe Pine Ridge?

- _____
- _____
- _____

3 Human–Environment Interaction

How do people in Pine Ridge interact with the natural environment?

4 Movement

How do people and goods move into, out of, and around Pine Ridge?

5 Region

What type of region is Pine Ridge? Provide evidence to support your idea.

THINK GEO

If a new business wanted to open in Pine Ridge, where would be the best location? Use evidence from the map to explain your choice.

FIGURE 1.10

CHAPTER CHALLENGE

INVESTIGATING CANADA'S BIOMES

Why do different biomes occur in different parts of Canada?

Use geographic evidence and spatial variables to explain biome patterns across Canada.



SECTION 6: CHAPTER 1 SUMMARY

Geographers seek to understand why geographic patterns exist and how places change over time. They begin by making careful observations and identifying patterns in the natural and human world. To explain

these patterns, geographers investigate spatial variables, which are geographic characteristics that vary from place to place. Physical spatial variables include factors such as climate, elevation, water availability, and geology, while human spatial variables result from human activities and decisions.

Geography is often organized into two interconnected fields: physical geography and human geography. Physical geography investigates natural features and processes, while human geography examines people, communities, and the ways humans interact with environments. Because physical and human systems influence one another, geographers frequently study both together.

Geographers also rely on maps, aerial photographs, satellite imagery, diagrams, graphs, and Geographic Information Systems (GIS) to investigate places and communicate information. Each representation provides a different perspective and reveals different geographic patterns.

To guide their investigations, geographers use the geographic inquiry process and often organize their observations using the Five Themes of Geography: Location, Place, Human-Environment Interaction, Movement, and Region. These tools help geographers ask questions, gather evidence, identify relationships among spatial variables, and develop explanations that deepen our understanding of Canada's physical geography.

SECTION 7: CHAPTER REVIEW QUESTIONS

Knowledge and Understanding

1. What is a spatial variable, and why is it important in geography?

2. Identify three examples of physical spatial variables and explain how each can influence geographic patterns.
3. What is the difference between physical geography and human geography?
4. List the Five Themes of Geography.

Thinking and Inquiry

1. Why do geographers use more than one geographic representation when studying a place?
2. Explain why a single spatial variable is usually not enough to explain a geographic pattern.
3. Describe how physical and human geography can influence one another. Use a specific example.

Application

1. Imagine a new community is being planned near a river. Identify two physical spatial variables and two human spatial variables that planners should consider.
2. Choose a physical feature in your local area, such as a creek, forest, wetland, or escarpment. Using two of the Five Themes of Geography, explain how a geographer might study that feature.
3. A large forest covers one region of Canada, while a nearby region is mostly grassland. Apply what you have learned about spatial variables to explain why these two regions might be different.