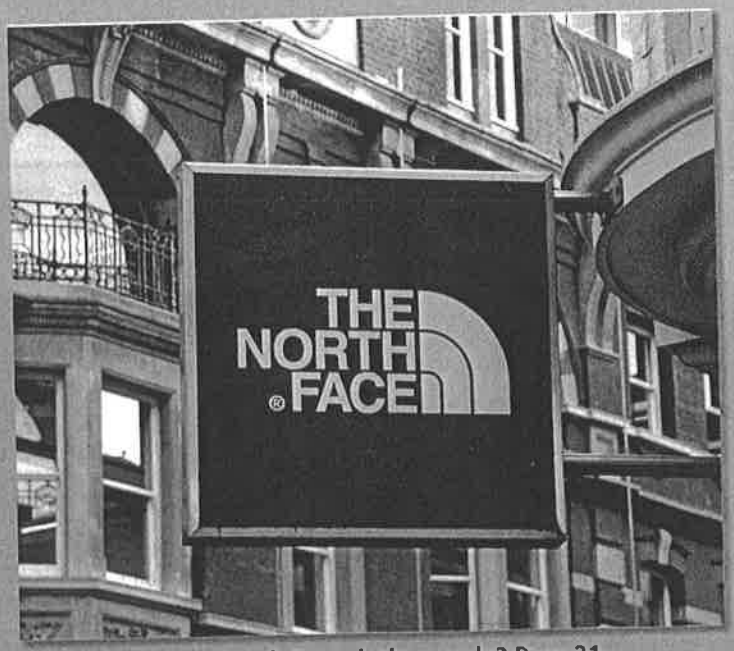
Chapter

1 Basic Concepts

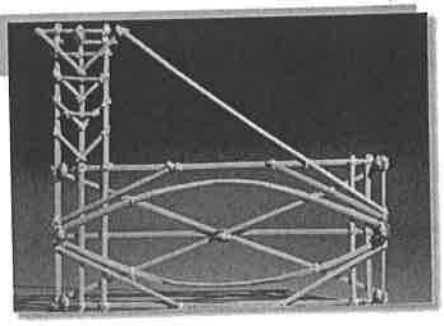
Why are these people driving around your neighborhood with a camera on their roof? Page 12



Where were your North Face clothes made? Page 21

KEY ISSUE 1

How Do Geographers Describe Where Things Are?



Mapping then and now p. 5

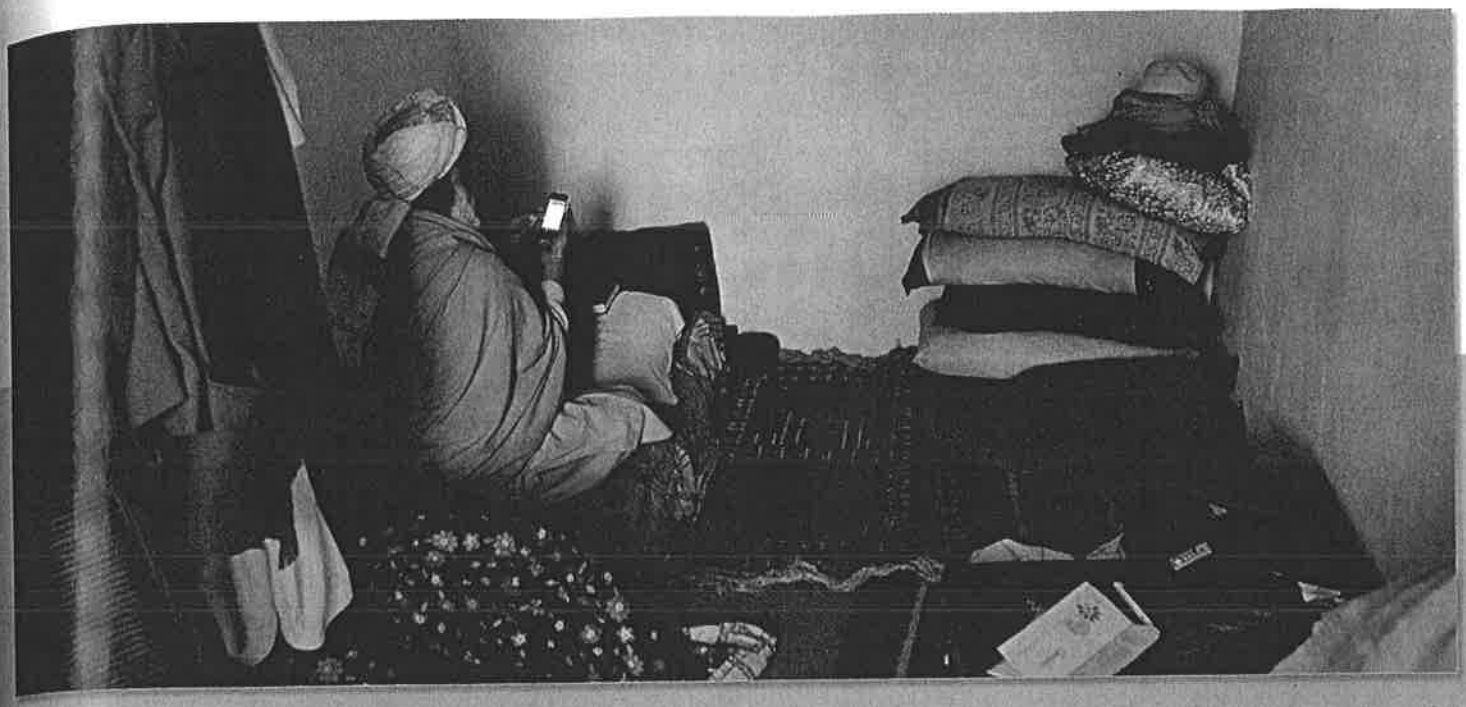
Mapmaking has come a long way, from sticks and shells to satellite mashups. Why are maps so important to geographers?

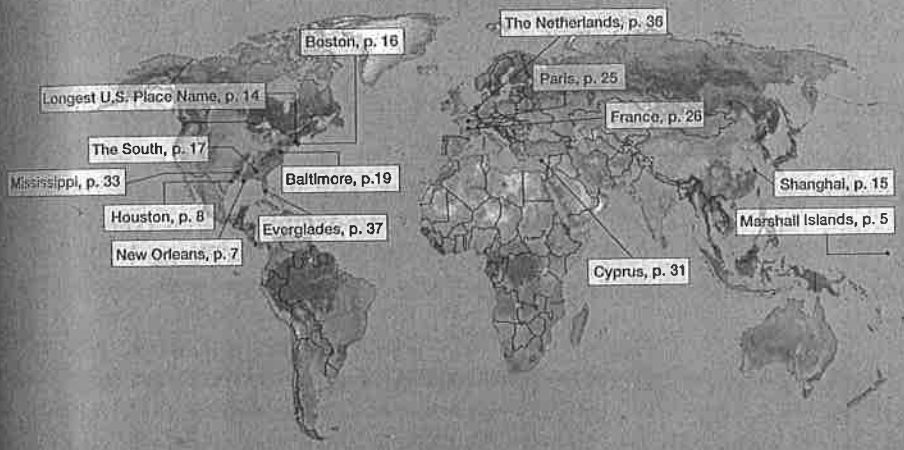
KEY ISSUE 2

Why Is Each Point On Earth Unique?

My place in the world p. 14

Where am I? The tiny spot on Earth that each of us inhabits is a special place to us—and for good reason.





▲ Geographers see people everywhere, including this Muslim clergyman in Afghanistan, Twittering on his smart phone, being pulled in opposite directions by two factors—globalization and local diversity. Modern communications and technology foster globalization, pulling people into greater cultural and economic interaction with others. At the same time, people are searching for more ways to express their unique cultural traditions and economic practices.

KEY ISSUE 3

Why Are Different Places Similar?

KEY ISSUE 4

Why Are Some Human Actions Not Sustainable?

A world of similarities and differences p. 21

We are bound together with the rest of the world—whether we like it or not. How do we fit into a global economy and society?

Caring for Earth p. 31

Earth has been entrusted to us. Will we leave it in better shape than we inherited it—or in worse shape?

Introducing

Basic Concepts

What do you expect from this geography course? You may think that geography involves memorizing lists of countries and capitals. Perhaps you associate geography with photographic essays of exotic places in popular magazines. Contemporary geography is the scientific study of where people and activities are found across Earth's surface and the reasons why they are found there.

In his framework of all scientific knowledge, the German philosopher Immanuel Kant (1724–1804) compared geography and history:

Geographers . . .	Historians . . .
identify the location of important places and explain why human activities are located beside one another.	identify the dates of important events and explain why human activities follow one another chronologically.
ask where and why.	ask when and why.
organize material spatially.	organize material chronologically.
recognize that an action at one point on Earth can result from something happening at another point, which can consequently affect conditions elsewhere.	recognize that an action at one point in time can result from past actions that can in turn affect future ones.

History and geography differ in one especially important manner: A historian cannot enter a time machine to study other eras firsthand; however, a geographer can enter an automobile or airplane to study Earth's surface. This ability to reach other places lends excitement to the discipline of geography—and geographic training raises the understanding of other spaces to a level above that of casual sightseeing.

To introduce human geography, we concentrate on two main features of human behavior—culture and economy. The first half of the book explains why the most important cultural features, such as major languages, religions, and ethnicities, are arranged as they are across Earth. The second half of the book looks at the locations of the most important economic activities, including agriculture, manufacturing, and services.

This chapter introduces basic concepts that geographers employ to address their "where" and "why" questions. Many of these concepts are words commonly employed in English but given particular meaning by geographers:

- KEY ISSUE **1** looks at geography's most important tool—mapping. Accurate maps are constructed from satellite imagery, such as Figures 1-1 and 1-2.
- KEY ISSUE **2** addresses the first of two principal "why" questions. Geographers want to know why each point on Earth is in some ways unique. For example, why does Figure 1-2 have some bright points and some dark areas?
- KEY ISSUE **3** looks at why different places on Earth have similar features. For example, what common features distinguish the bright areas in Figure 1-2?
- KEY ISSUE **4** discusses sustainability. Distinctive to geography is the importance given to relationships between human activities and the physical environment. For example, what are the relationships between the tan areas in Figure 1-1 and the dark areas in Figure 1-2? This book focuses on human geography, but it doesn't forget that we also need to understand how humans interact with Earth's atmosphere, water, vegetation, and other living creatures.

► FIGURE 1-1 SATELLITE IMAGE: DAYTIME The composite image was assembled by the Geosphere Project of Santa Monica, California. Thousands of images were recorded over a 10-month period by satellites of the National Oceanographic and Atmospheric Administration. The images were then electronically assembled, much like a jigsaw puzzle.

KEY ISSUE 1

How Do Geographers Describe Where Things Are?

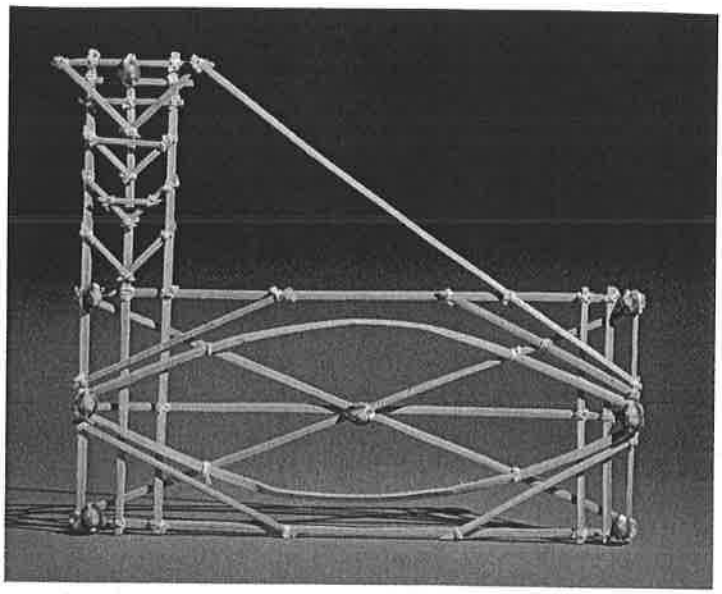
- Maps
- Contemporary Tools

The word *geography*, invented by the ancient Greek scholar Eratosthenes, is based on two Greek words. *Geo* means "Earth," and *graphy* means "to write." Geography is the study of where things are found on Earth's surface and the reasons for the locations. Human geographers ask two simple questions: Where are people and activities found on Earth? Why are they found there?

Thinking geographically is one of the oldest human activities (Figure 1-3). Perhaps the first geographer was a prehistoric human who crossed a river or climbed a hill, observed what was on the other side, returned home to tell about it, and scratched the route in the dirt. Perhaps the second geographer was a friend or relative who followed the dirt drawing to reach the other side.

Maps

Geography's most important tool for thinking spatially about the distribution of features across Earth is a map. A **map** is a two-dimensional or flat-scale model of Earth's surface, or a portion of it. A map is a scale model of the real world, made small enough to work with on a desk or computer. It can be a hasty here's-how-to-get-to-the-party sketch, an elaborate work of art, or a precise computer-generated product. For centuries, geographers have worked to perfect the science of mapmaking, called **cartography.**



▲ **FIGURE 1-3 POLYNESIAN "STICK CHART"** A "stick chart" is a type of ancient map created by people living in the present-day Marshall Islands in the South Pacific Ocean. Islands were shown with shells, and patterns of swelling of waves were shown with palm strips.

Contemporary cartographers are assisted by computers and satellite imagery.

Geography is immediately distinguished from other disciplines by its reliance on maps to display and analyze information. A map serves two purposes:

- **As a reference tool.** A map helps us to find the shortest route between two places and to avoid getting lost along the way. We consult maps to learn where in the world something is found, especially in relationship to a place we know, such as a town, body of water, or highway. The maps in an atlas or a road map are especially useful for this purpose.
- **As a communications tool.** A map is often the best means for depicting the distribution of human activities or physical features, as well as for thinking about reasons underlying a distribution.

▶ **FIGURE 1-2 SATELLITE IMAGE: NIGHTTIME** The portion of Earth illuminated at night reflects the distribution of electricity. The dark areas are either sparsely inhabited areas, such as deserts and mountains, or areas where people are too poor to have electricity.

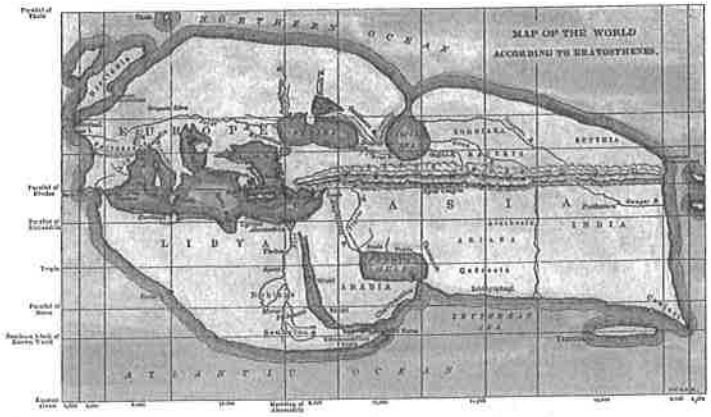
EARLY MAPMAKING

Learning Outcome 1.1.1
Explain differences between early maps and contemporary maps.

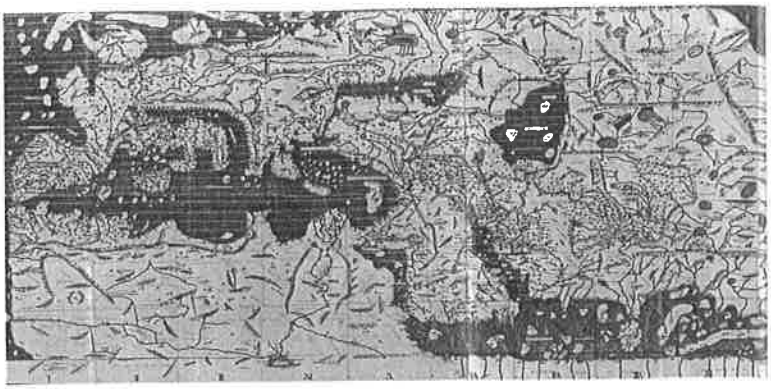
The earliest maps were reference tools—simple navigation devices designed to show a traveler how to get from Point A to Point B. Eratosthenes (276?–194? B.C.), the first person of record to use the word *geography*, prepared one of the earliest maps of the known world (Figure 1-4). Ptolemy (A.D. 100?–170?) produced maps that were not improved upon for more than 1,000 years, based on information collected by merchants and soldiers who traveled through the Roman Empire.

After Ptolemy, little progress in mapmaking or geographic thought was made in Europe for several hundred years. Maps became less mathematical and more fanciful, showing Earth as a flat disk surrounded by fierce animals and monsters. Geographic inquiry continued, though, outside Europe. Pei Xiu, the "father of Chinese cartography," produced an elaborate map of China in A.D. 267. Building on Ptolemy's long-neglected work, Muhammad al-Idrisi (1100–1165?), a Muslim geographer, prepared a world map and geography text in 1154 (Figure 1-5).

Mapmaking as a reference tool revived during the Age of Exploration and Discovery. Columbus, Magellan, and other explorers who sailed across the oceans in search of trade routes and resources in the fifteenth and sixteenth centuries required accurate maps to reach desired destinations without wrecking their ships. In turn, cartographers took information collected by the explorers to create more accurate maps. German cartographer Martin Waldseemuller (1470?–1520) produced the first map with the label "America"; he wrote on the map (translated from Latin) "from Amerigo the discoverer . . . as if it were the land of Americus, thus 'America'". Abraham Ortelius (1527–1598), a Flemish cartographer, created the first modern atlas (Figure 1-6).



▲ **FIGURE 1-4 WORLD MAP BY ERATOSTHENES, 194? B.C.** This is a nineteenth-century reconstruction of the map produced by Eratosthenes.



▲ **FIGURE 1-5 WORLD MAP BY AL-IDRISI, 1154** Al-Idrisi built on Ptolemy's map, which had been neglected for nearly a millennium.

By the seventeenth century, maps accurately displayed the outline of most continents and the positions of oceans. Bernhardus Varenius (1622–1650) produced *Geographia Generalis*, which stood for more than a century as the standard treatise on systematic geography.

Pause and Reflect 1.1.1
What is one main difference between Eratosthenes's world map (Figure 1-4) and the word map of Ortelius (Figure 1-6)?

CONTEMPORARY MAPPING

Contemporary maps are still created as tools of reference, but human geographers now make use of maps primarily as tools of communication. Maps are geographers' most essential tool for displaying geographic information and for offering geographic explanation. The feature on page 7 includes a contemporary use of maps to demonstrate issues of sustainability and inequality in New Orleans.

▲ **FIGURE 1-6 WORLD MAP BY ORTELIUS, 1571** This map was one of the first to show the extent of the Western Hemisphere, as well as Antarctica.

SUSTAINABILITY AND INEQUALITY IN OUR GLOBAL VILLAGE

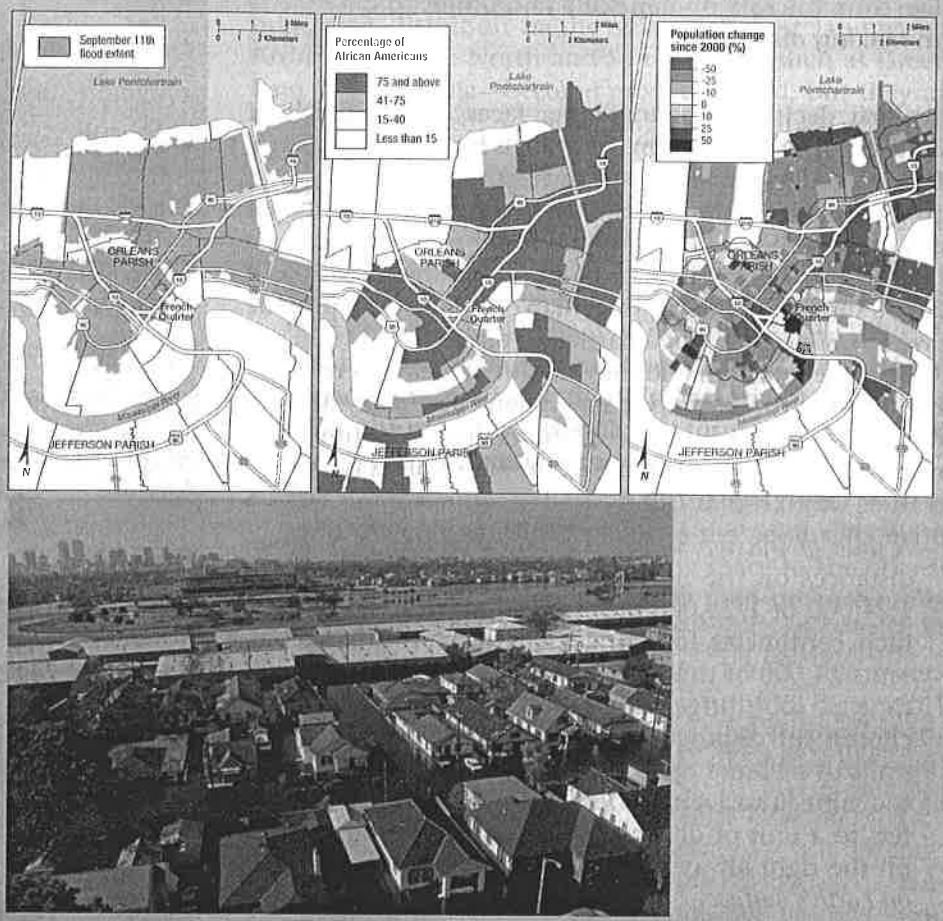
Mapping a Disaster: Hurricane Katrina

Hurricane Katrina, one of the strongest hurricanes ever to hit the United States, struck in 2005. It killed 1,836 people and was the costliest natural disaster in U.S. history, measured in the dollar value of the destruction. The aftermath of Katrina provides a useful introduction to geographic perspectives on contemporary global issues of sustainability and inequality. Is a city like New Orleans—below sea level and protected by aging levees—sustainable in an era of rising sea levels and stronger hurricanes? Why did Katrina affect residents of New Orleans so unequally, with lower-income people much more likely to die or become homeless than more wealthy people?

Hurricanes such as Katrina form in the Atlantic Ocean during the late summer and autumn and gather strength over the warm waters of the Gulf of Mexico. When a hurricane passes over land, it can generate a powerful storm surge that floods low-lying areas. New Orleans was especially vulnerable because the site of the city is below sea level. To protect it and other low-lying cities from flooding, government agencies had constructed a complex system of levees, dikes, seawalls, canals, and pumps (Figure 1-7, left). Two days after the hurricane hit, the flood-protection levees in New Orleans broke, flooding 80 percent of the city (Figure 1-7, bottom).

Human geographers are especially concerned with the inequality of the destruction. Katrina's victims were primarily poor, African American, and older individuals (Figure 1-7, center). They lived in the lowest-lying areas, most vulnerable to flooding, and many lacked transportation, money, and information that would have enabled them to evacuate in advance of the storm. In contrast, the wealthy portions of New Orleans, such as tourist attractions like the Vieux Carré (French Quarter), were spared the worst because they were located on slightly higher ground. The slow and incompetent response to the destruction by local, state, and federal emergency teams was attributed by many analysts to the victims' lack of a voice in the political, economic, and social life of New Orleans and other impacted communities.

Inequalities persist several years after the hurricane (Figure 1-7, right). Five years after Katrina, according to the 2010 census, a large percentage of African Americans had still not returned to New Orleans. According to the census, the population of New Orleans declined from 484,674 in 2000 to 343,829 in 2010. African Americans accounted for 84 percent of the decline because most of the houses that remained damaged from the hurricane were in predominantly African American neighborhoods. The percentage of African Americans in New Orleans declined from 67 percent in 2000 to 60 percent in 2010.



▲ FIGURE 1-7 SUSTAINABILITY AND INEQUALITY IN NEW ORLEANS (left) Extent of flooding in New Orleans from storm surge after Katrina. (middle) Two-thirds of the population of New Orleans was African American, but the area spared the flooding was less than one-fourth African American. (right) The percentage of homes that have been fixed up and reoccupied since Katrina is lower in the areas that had relatively large African American populations than in other areas. (bottom) Flooded neighborhood in New Orleans nine days after Katrina.

MAP SCALE

Learning Outcome 1.1.2
Describe the role of map scale and projections in making maps.

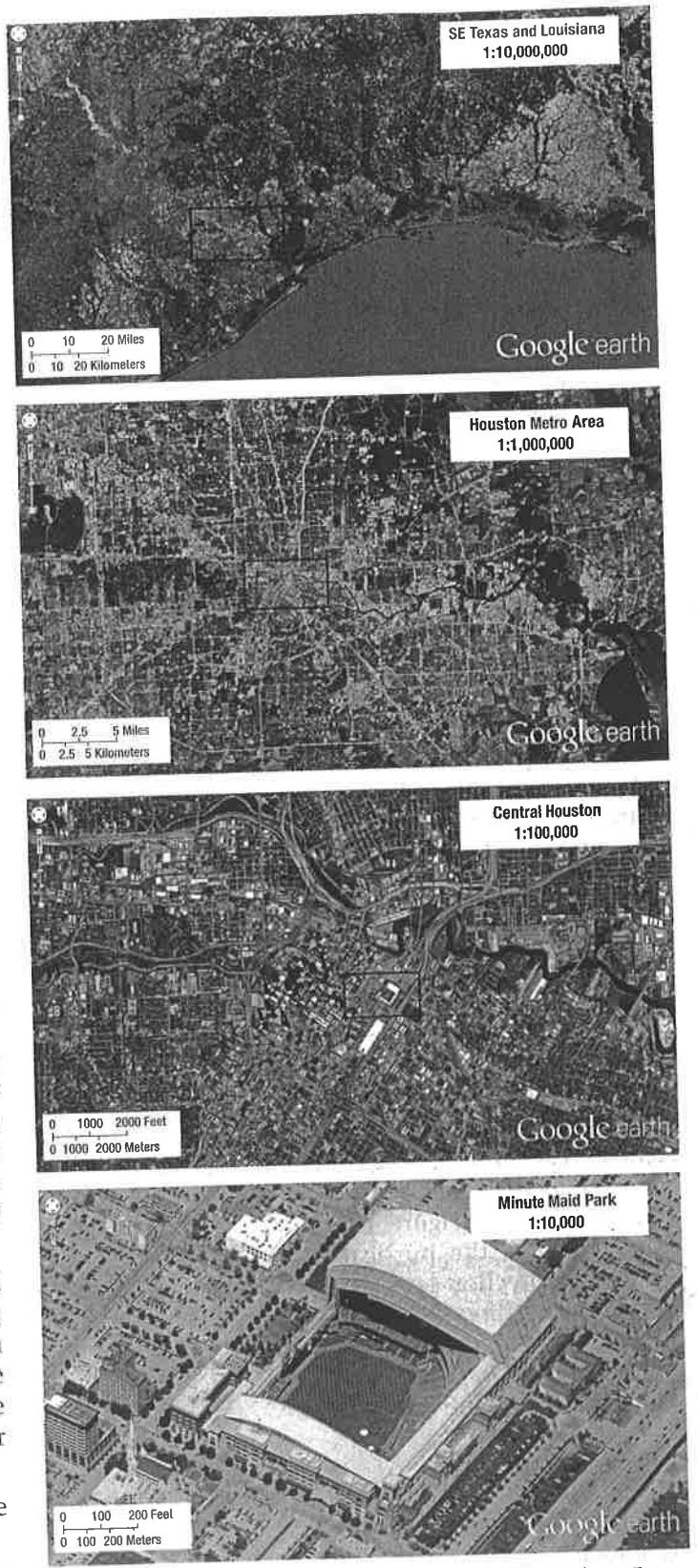
The first decision a cartographer faces is how much of Earth's surface to depict on the map. Is it necessary to show the entire globe, or just one continent, or a country, or a city? To make a scale model of the entire world, many details must be omitted because there simply is not enough space. Conversely, if a map shows only a small portion of Earth's surface, such as a street map of a city, it can provide a wealth of detail about a particular place.

The level of detail and the amount of area covered on a map depend on its **map scale.** When specifically applied to a map, scale refers to the relationship of a feature's size on a map to its actual size on Earth. Map scale is presented in three ways (Figure 1-8).

- A *ratio or fraction* shows the numerical ratio between distances on the map and Earth's surface. A scale of 1:24,000 or 1/24,000 means that 1 unit (for example, inch, centimeter, foot, finger length) on the map represents 24,000 of the same unit (for example, inch, centimeter, foot, finger length) on the ground. The unit chosen for distance can be anything, as long as the units of measure on both the map and the ground are the same. The 1 on the left side of the ratio always refers to a unit of distance *on the map*, and the number on the right always refers to the *same unit* of distance *on Earth's surface.*
- A *written scale* describes the relationship between map and Earth distances in words. For example, the statement "1 inch equals 1 mile" on a map means that 1 inch on the map represents 1 mile on Earth's surface. Again, the first number always refers to map distance and the second to distance on Earth's surface.
- A *graphic scale* usually consists of a bar line marked to show distance on Earth's surface. To use a bar line, first determine with a ruler the distance on the map in inches or centimeters. Then hold the ruler against the bar line and read the number on the bar line opposite the map distance on the ruler. The number on the bar line is the equivalent distance on Earth's surface.

Maps often display scale in more than one of these three ways.

The appropriate scale for a map depends on the information being portrayed. A map of a downtown area, such as Figure 1-8, bottom, may have a scale of 1:10,000, whereas a map of southeast Texas (Figure 1-8, top) may have a scale of 1:10,000,000. One inch represents about 1/6 mile on the downtown Houston map and about 170 miles on the southeast Texas map.



▲ **FIGURE 1-8 MAP SCALE** The four images show (top) southeast Texas (second), the city of Houston (third), downtown Houston, and (bottom) Minute Maid Park. The map of southeastern Texas has a fractional scale of 1:10,000,000. Expressed as a written statement, 1 inch on the map represents 10 million inches (about 158 miles) on the ground. Look what happens to the scale on the other three maps. As the area covered gets smaller, the maps get more detailed, and 1 inch on the map represents smaller distances.

At the scale of a small portion of Earth's surface, such as a downtown area, a map provides a wealth of details about the place. At the scale of the entire globe, a map must omit many details because of lack of space, but it can effectively communicate processes and trends that affect everyone.

PROJECTION

Earth is very nearly a sphere and is therefore accurately represented with a globe. However, a globe is an extremely limited tool with which to communicate information about Earth's surface. A small globe does not have enough space to display detailed information, whereas a large globe is too bulky and cumbersome to use. And a globe is difficult to write on, photocopy, display on a computer screen, or carry in the glove box of a car. Consequently, most maps—including those in this book—are flat. Three-dimensional maps can be made but are expensive and difficult to reproduce.

Earth's spherical shape poses a challenge for cartographers because drawing Earth on a flat piece of paper unavoidably produces some distortion. Cartographers have invented hundreds of clever methods of producing flat maps, but none has produced perfect results. The scientific method of transferring locations on Earth's surface to a flat map is called **projection** (Figure 1-9).

The problem of distortion is especially severe for maps depicting the entire world. Four types of distortion can result:

1. The *shape* of an area can be distorted, so that it appears more elongated or squat than in reality.
2. The *distance* between two points may become increased or decreased.
3. The *relative size* of different areas may be altered, so that one area may appear larger than another on a map but is in reality smaller.
4. The *direction* from one place to another can be distorted.

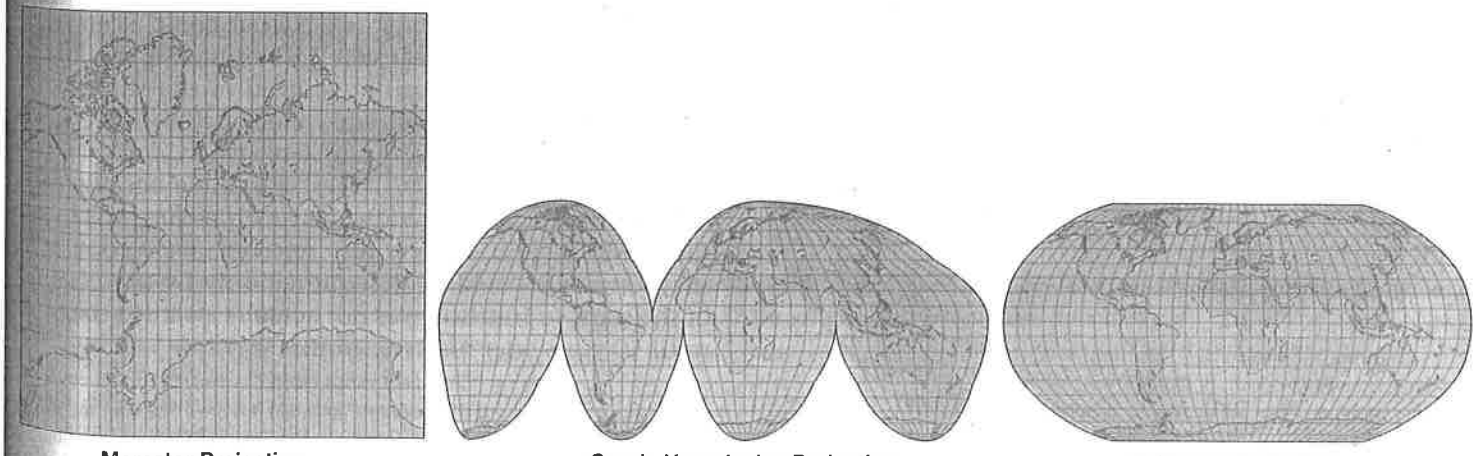
Most of the world maps in this book, such as Figure 1-9 center, are *equal area projections*. The primary benefit of this type of projection is that the relative sizes of the landmasses on the map are the same as in reality. The projection minimizes distortion in the shapes of most landmasses. Areas toward the North and South poles—such as Greenland and Australia—become more distorted, but they are sparsely inhabited, so distorting their shapes usually is not important.

To largely preserve the size and shape of landmasses, however, the projection in Figure 1-9 center forces other distortions:

- The Eastern and Western hemispheres are separated into two pieces, a characteristic known as interruption.
- The meridians (the vertical lines), which in reality converge at the North and South poles, do not converge at all on the map. Also, they do not form right angles with the parallels (the horizontal lines).
- The Robinson projection, in Figure 1-9 right, is useful for displaying information across the oceans. Its major disadvantage is that by allocating space to the oceans, the land areas are much smaller than on interrupted maps of the same size.
- The Mercator projection, in Figure 1-9 left, has several advantages: Shape is distorted very little, direction is consistent, and the map is rectangular. Its greatest disadvantage is that relative size is grossly distorted toward the poles, making high-latitude places look much larger than they actually are.

Pause and Reflect 1.1.2

What type of projection would be best for a world map of population density? Why?



▲ **FIGURE 1-9 PROJECTION**
(left) Mercator projection, (center) equal area projection, (right) Robinson projection. Compare the sizes of Greenland and South America on these maps. Which of the two landmasses is actually larger?

GEOGRAPHIC GRID

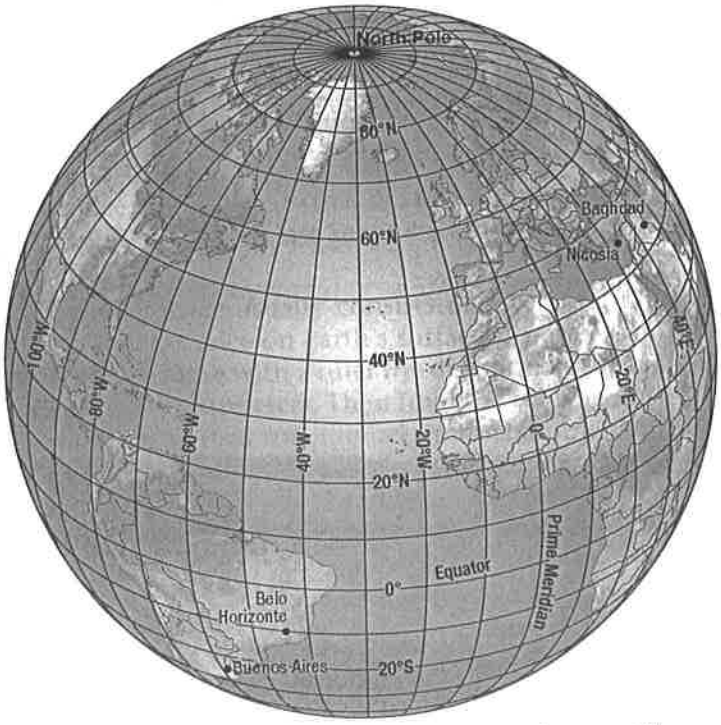
Learning Outcome 1.1.3
Explain how latitude and longitude are used to locate points on Earth's surface.

The geographic grid is a system of imaginary arcs drawn in a grid pattern on Earth's surface. The location of any place on Earth's surface can be described precisely by meridians and parallels, two sets of imaginary arcs drawn in a grid pattern on Earth's surface (Figure 1-10). The geographic grid plays an important role in telling time:

- A **meridian** is an arc drawn between the North and South poles. The location of each meridian is identified on Earth's surface according to a numbering system known as **longitude.**

The meridian that passes through the Royal Observatory at Greenwich, England, is 0° longitude, also called the **prime meridian.** The meridian on the opposite side of the globe from the prime meridian is 180° longitude. All other meridians have numbers between 0° and 180° east or west, depending on whether they are east or west of the prime meridian. For example, Belo Horizonte, Brazil, is located at 44° west longitude and Baghdad, Iraq, at 44° east longitude.

- A **parallel** is a circle drawn around the globe parallel to the equator and at right angles to the meridians. The numbering system to indicate the location of a parallel is called **latitude.**



▲ **FIGURE 1-10 GEOGRAPHIC GRID** Meridians are arcs that connect the North and South poles. The meridian through Greenwich, England, is the prime meridian, or 0° longitude. Parallels are circles drawn around the globe parallel to the equator. The equator is 0° latitude, and the North Pole is 90° north latitude.

The equator is 0° latitude, the North Pole 90° north latitude, and the South Pole 90° south latitude. Nicosia, Cyprus, is located at 35° north latitude and Buenos Aires, Argentina, at 35° south latitude.

Latitude and longitude are used together to identify locations. For example, Denver, Colorado, is located at 40° north latitude and 105° west longitude.

The mathematical location of a place can be designated more precisely by dividing each degree into 60 minutes (′) and each minute into 60 seconds (″). For example, the official mathematical location of Denver, Colorado, is 39°44′ north latitude and 104°59′ west longitude. The state capitol building in Denver is located at 39°42′2″ north latitude and 104°59′04″ west longitude. GPS systems typically divide degrees into decimal fractions rather than minutes and seconds. The Colorado state capitol, for example, is located at 39.714444° north latitude and 84.984444° west longitude.

Measuring latitude and longitude is a good example of how geography is partly a natural science and partly a study of human behavior. Latitudes are scientifically derived by Earth's shape and its rotation around the Sun. The equator (0° latitude) is the parallel with the largest circumference and is the place where every day has 12 hours of daylight. Even in ancient times, latitude could be accurately measured by the length of daylight and the position of the Sun and stars.

On the other hand, 0° longitude is a human creation. Any meridian could have been selected as 0° longitude because all meridians have the same length and all run between the poles. The 0° longitude runs through Greenwich because England was the world's most powerful country when longitude was first accurately measured and the international agreement was made.

Inability to measure longitude was the greatest obstacle to exploration and discovery for many centuries. Ships ran aground or were lost at sea because no one on board could pinpoint longitude. In 1714, the British Parliament enacted the Longitude Act, which offered a prize equivalent to several million in today's dollars to the person who could first measure longitude accurately.

English clockmaker John Harrison won the prize by inventing the first portable clock that could keep accurate time on a ship—because it did not have a pendulum. When the Sun was directly overhead of the ship—noon local time—Harrison's portable clock set to Greenwich time could say it was 2 P.M. in Greenwich, for example, so the ship would be at 30° west longitude because each hour of difference was equivalent to traveling 15° longitude. (Most eighteenth-century scientists were convinced that longitude could be determined only by the position of the stars, so Harrison was not actually awarded the prize until 40 years after his invention.)

TELLING TIME

Longitude plays an important role in calculating time. Earth as a sphere is divided into 360° of longitude (the degrees from 0° to 180° west longitude plus the degrees from 0° to 180° east longitude).

As Earth rotates daily, these 360 imaginary lines of longitude pass beneath the cascading sunshine. If we let every fifteenth degree of longitude represent one time zone, and divide the 360° by 15°, we get 24 time zones, or one for each hour of the day. By international agreement, **Greenwich Mean Time (GMT)**, or Universal Time (UT), which is the time at the prime meridian (0° longitude), is the master reference time for all points on Earth.

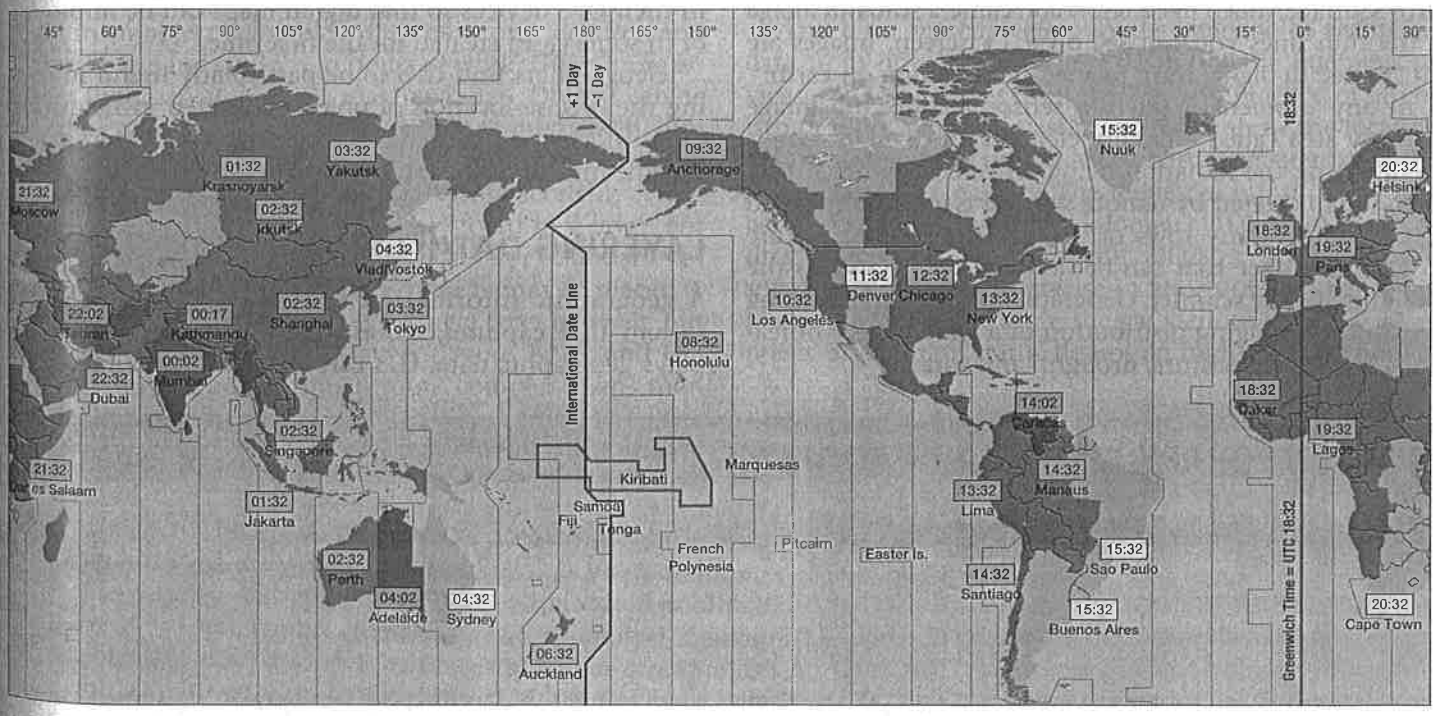
Each 15° band of longitude is assigned to a standard time zone (Figure 1-11). The eastern United States, which is near 75° west longitude, is therefore 5 hours earlier than GMT (the 75° difference between the prime meridian and 75° west longitude, divided by 15° per hour, equals 5 hours). Thus when the time in New York City in the winter is 1:32 P.M. (or 13:32 hours, using a 24-hour clock), it is 6:32 P.M. (or 18:32 hours) GMT. During the summer, many places in the world, including most of North America, move the clocks ahead one hour; so in the summer when it is 6:32 P.M. GMT, the time in New York City is 2:32 P.M.

When you cross the **International Date Line**, which, for the most part, follows 180° longitude, you move the clock back 24 hours, or one entire day, if you are heading eastward toward America. You turn the clock ahead 24 hours if you are heading westward toward Asia. To see the need for the International Date Line, try counting the hours around the world from the time zone in which you live. As you go from west to east, you add 1 hour for each time zone. When you return to your starting point, you will reach the absurd conclusion that it is 24 hours later in your locality than it really is. Therefore—if it is 6:32 A.M. *Monday* in Auckland, when you get to Honolulu, it will be 8:32 A.M. *Sunday* because the International Date Line lies between Auckland and Honolulu.

The International Date Line for the most part follows 180° longitude. However, several islands in the Pacific Ocean belonging to the countries of Kiribati and Samoa, as well as to New Zealand's Tokelau territory, moved the International Date Line several thousand kilometers to the east. Samoa and Tokelau moved it in 2011 so that they could be on the same day as Australia and New Zealand, their major trading partners. Kiribati moved it in 1997 so that it would be the first country to see each day's sunrise. Kiribati hoped that this feature would attract tourists to celebrate the start of the new millennium on January 1, 2000 (or January 1, 2001, when sticklers pointed out the new millennium really began). But it did not.

Pause and Reflect 1.1.3

Compare the stick chart in Figure 1-3 with the geographic grid in Figure 1-10. What are their similarities and differences?



▲ FIGURE 1-11 TIME ZONES

The United States and Canada share four standard time zones:

- Eastern, near 75° west, is 5 hours earlier than GMT.
- Central, near 90° west, is 6 hours earlier than GMT.
- Mountain, near 105° west, is 7 hours earlier than GMT.
- Pacific, near 120° west, is 8 hours earlier than GMT.

The United States has two additional standard time zones:

- Alaska, near 135° west, is 9 hours earlier than GMT.
- Hawaii-Aleutian, near 150° west, is 10 hours earlier than GMT.

Canada has two additional standard time zones:

- Atlantic, near 60° west, is 4 hours earlier than GMT.
- Newfoundland is 3½ hours earlier than GMT; the residents of Newfoundland assert that their island, which lies between 53° and 59° west longitude, would face dark winter afternoons if it were in the Atlantic Time Zone and dark winter mornings if it were 3 hours earlier than GMT.

Contemporary Tools

Learning Outcome 1.1.4
Identify contemporary analytic tools, including remote sensing, GPS, and GIS.

Having largely completed the formidable task of accurately mapping Earth's surface, geographers have turned to **geographic information science (GIScience)**, which involves the development and analysis of data about Earth acquired through satellite and other electronic information technologies. GIScience helps geographers to create more accurate and complex maps and to measure changes over time in the characteristics of places.

GIScience is made possible by satellites in orbit above Earth sending information to electronic devices on Earth to record and interpret information. Satellite-based information allows us to know the precise location of something on Earth and data about that place.

COLLECTING DATA: REMOTE SENSING

The acquisition of data about Earth's surface from a satellite orbiting Earth or from other long-distance methods is known as **remote sensing.** Remote-sensing satellites scan Earth's surface, much like a television camera scans an image in the thin lines you can see on a TV screen. Images are transmitted in digital form to a receiving station on Earth.

At any moment a satellite sensor records the image of a tiny area called a picture element, or pixel. Scanners are detecting the radiation being reflected from that tiny area. A map created by remote sensing is essentially a grid that contains many rows of pixels. The smallest feature on Earth's surface that can be detected by a sensor is the resolution of the scanner. Geographers use remote sensing to map the changing distribution of a wide variety of features, such as agriculture, drought, and sprawl.

PINPOINTING LOCATIONS: GPS

The system that accurately determines the precise position of something on Earth is the **Global Positioning System (GPS).** The GPS in the United States includes three elements:

- Satellites placed in predetermined orbits by the U.S. military (24 in operation and 3 in reserve).
- Tracking stations to monitor and control the satellites.
- A receiver that can locate at least 4 satellites, figure out the distance to each, and use this information to pinpoint its own location.

GPS is most commonly used for navigation, as discussed in the Contemporary Geographic Tools box. Pilots of aircraft and ships stay on course with GPS. On land, GPS detects a vehicle's current position, the motorist programs the desired destination into a GPS device, and the device provides instructions on how to reach the destination. GPS can also be used to find the precise location of a vehicle, enabling a motorist to summon help in an emergency or monitoring the progress of a delivery truck or position of a city bus. Cell phones equipped with GPS allow individuals to share their whereabouts with others.

GPS devices enable private individuals to contribute to the production of accurate digital maps, through web sites such as Google's OpenStreetMap.org. Travelers can enter information about streets, buildings, and bodies of water in their GPS devices so that digital maps can be improved or in some cases created for the first time.

Geographers find GPS to be particularly useful in coding the precise location of objects collected in fieldwork. That information can later be entered as a layer in a geographic information system (GIS), discussed next.

LAYERING DATA: GIS

A **geographic information system (GIS)** is a computer system that captures, stores, queries, analyzes, and displays geographic data. GIS can be used to produce maps

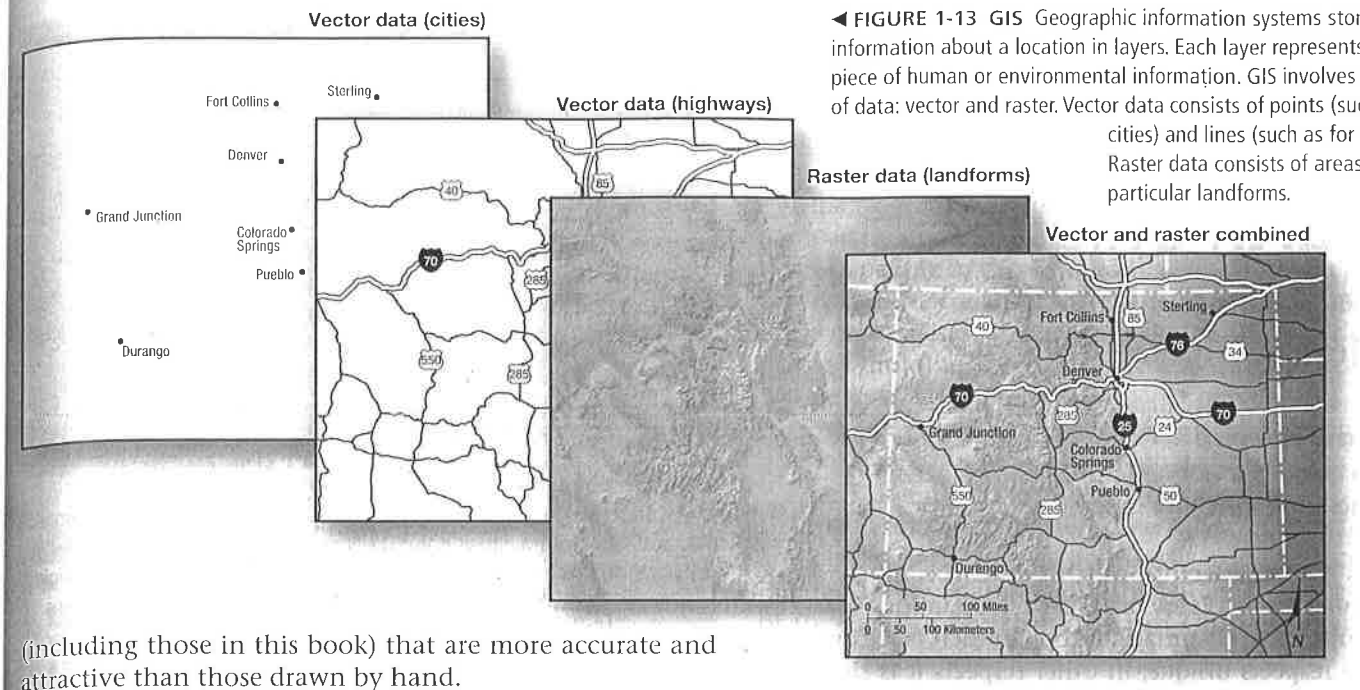
CONTEMPORARY GEOGRAPHIC TOOLS

Electronic Navigation

Two companies are responsible for supplying most of the information fed into navigation devices: Navteq, short for Navigation Technologies, and Tele Atlas, originally known as Etak. Tele Atlas, based in the Netherlands was founded in 1984, and Navteq, based in the United States, was founded a year later. Navteq and Tele Atlas get their information from what they call "ground truthing." Hundreds of field researchers drive around, building the database. One person drives, while the other feeds information into a notebook computer (Figure 1-12). Hundreds of attributes are recorded, such as crosswalks, turn restrictions, and name changes. Thus, electronic navigation systems ultimately depend on human observation.

A reflection of the growing importance of navigation technology, Navteq and Tele Atlas were both acquired in 2008 by larger communications companies (Nokia and Tom Tom, respectively).

▲ FIGURE 1-12 GPS Navteq researchers at work in Florida.



◀ **FIGURE 1-13 GIS** Geographic information systems store information about a location in layers. Each layer represents a different piece of human or environmental information. GIS involves two types of data: vector and raster. Vector data consists of points (such as for cities) and lines (such as for highways). Raster data consists of areas, such as particular landforms.

(including those in this book) that are more accurate and attractive than those drawn by hand.

The position of any object on Earth can be measured and recorded with mathematical precision and then stored in a computer. A map can be created by asking the computer to retrieve a number of stored objects and combine them to form an image. In the past, when cartographers drew maps with pen and paper, a careless moment could result in an object being placed in the wrong location, and a slip of the hand could ruin hours of work. GIS is more efficient than pen and ink for making a map: Objects can be added or removed, colors brightened or toned down, and mistakes corrected (as long as humans find them!) without having to tear up the paper and start from scratch.

Each type of information can be stored in a layer. For example, separate layers could be created for boundaries of countries, bodies of water, roads, and names of places. A simple map might display only a single layer by itself, but most maps combine several layers (Figure 1-13), and GIS permits construction of much more complex maps than can be drawn by hand.

Layers can be compared to show relationships among different kinds of information. For example, to protect hillsides from development, a geographer may wish to compare a layer of recently built houses with a layer of steep slopes. GIS enables geographers to calculate whether relationships between objects on a map are significant or merely coincidental. For example, maps showing where cancer rates are relatively high and low (such as those in Figure 1-25) can be combined with layers showing the location of people with various incomes and ethnicities, the location of different types of factories, and the location of mountains and valleys.

MIXING DATA: MASHUPS

Computer users have the ability to do their own GIS because mapping services provide access to the application programming interface (API), which is the language that links a database such as an address list with software such as mapping. The API for mapping software, available at such sites as www.google.com/apis/maps, enables a computer programmer to create a mashup that places data on a map.

The term *mashup* refers to the practice of overlaying data from one source on top of one of the mapping services; the term comes from the hip-hop practice of mixing two or more songs. A mashup map can show the locations of businesses and activities near a particular street or within a neighborhood in a city. The requested information could be all restaurants within 1 kilometer (0.6 mile) of an address or, to be even more specific, all pizza parlors. Mapping software can show the precise locations of commercial airplanes currently in the air, the gas stations with the lowest prices, and current traffic tie-ups on highways and bridges.

Pause and Reflect 1.1.4

State a question you have about the area where you live. Now describe a mashup that you could create using GIS that would answer your question.

CHECK-IN: KEY ISSUE 1

How Do Geographers Describe Where Things Are?

- ✓ **Maps are tools of reference and increasingly tools of communication. Reading a map requires recognizing its scale and projection.**
- ✓ **Contemporary mapping utilizes electronic technologies, such as remote sensing, GPS, and GIS.**

KEY ISSUE 2

Why Is Each Point on Earth Unique?

- Place: A Unique Location
- Region: A Unique Area

Learning Outcome 1.2.1
Identify geographic characteristics of places, including toponym, site, and situation.

A **place** is a specific point on Earth distinguished by a particular characteristic. Every place occupies a unique location, or position, on Earth's surface. Although each place on Earth is in some respects unique, in other respects it is similar to other places. The interplay between the uniqueness of each place and the similarities among places lies at the heart of geographic inquiry into why things are found where they are.

Place: A Unique Location

Humans possess a strong sense of place—that is, a feeling for the features that contribute to the distinctiveness of a particular spot on Earth—perhaps a hometown, vacation destination, or part of a country. Describing the features of a place is an essential building block for geographers to explain similarities, differences, and changes across Earth. Geographers think about where particular places are located and the combination of features that make each place on Earth distinct.

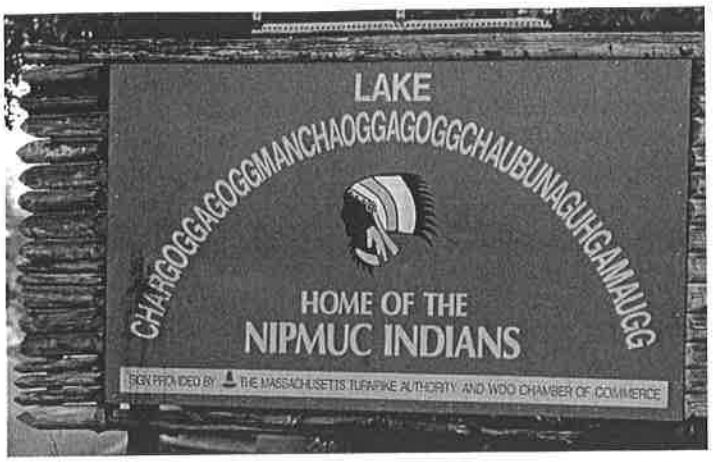
Geographers describe a feature's place on Earth by identifying its **location**, the position that something occupies on Earth's surface. In doing so, they consider three ways to identify location: place name, site, and situation.

PLACE NAMES

Because all inhabited places on Earth's surface—and many uninhabited places—have been named, the most straightforward way to describe a particular location is often by referring to its place name. A **toponym** is the name given to a place on Earth.

A place may be named for a person, perhaps its founder or a famous person with no connection to the community, such as George Washington. Some settlers select place names associated with religion, such as St. Louis and St. Paul, whereas other names derive from ancient history, such as Athens, Attica, and Rome, or from earlier occupants of the place (Figure 1-14).

A place name may also indicate the origin of its settlers. Place names commonly have British origins in North America and Australia, Portuguese origins in Brazil, Spanish origins elsewhere in Latin America, and Dutch origins in South Africa. Some place names derive from features of the physical environment. Trees, valleys, bodies of water, and other natural features appear in the place names of most languages.



▲ **FIGURE 1-14 LONGEST U.S. PLACE NAME** The longest place name in the United States may be Lake Chargoggagoggmanchauggagoggchaubunagungamaugg, Massachusetts. One hypothesis is that the name is Algonquian language for "fishing place at the boundaries—neutral meeting grounds." Others believe that the original meaning is unknown, and the current meaning and spelling are recent inventions.

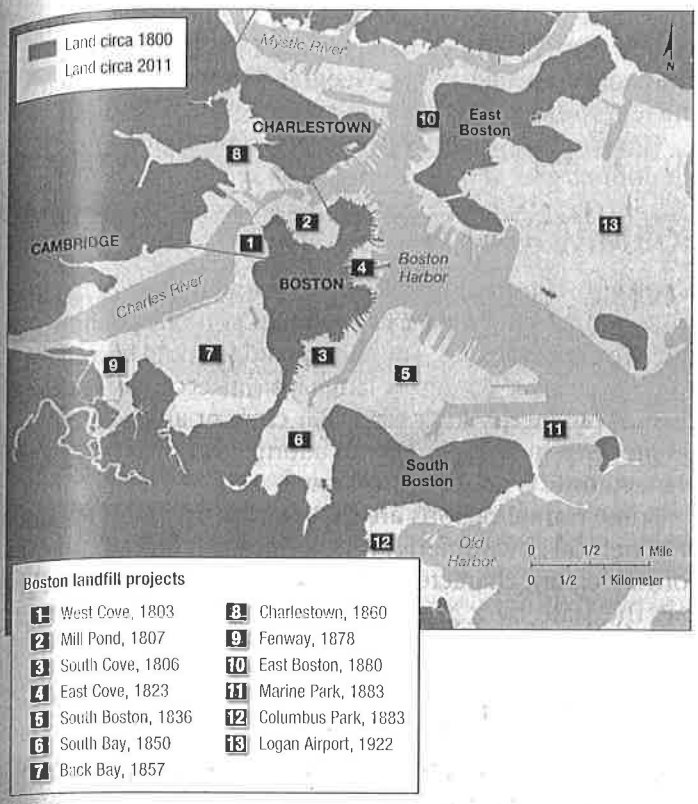
The Board of Geographical Names, operated by the U.S. Geological Survey, was established in the late nineteenth century to be the final arbiter of names on U.S. maps. In recent years the board has been especially concerned with removing offensive place names, such as those with racial or ethnic connotations.

SITE

The second way that geographers describe the location of a place is by **site**, which is the physical character of a place. Important site characteristics include climate, water sources, topography, soil, vegetation, latitude, and elevation. The combination of physical features gives each place a distinctive character.

Site factors have always been essential in selecting locations for settlements, although people have disagreed on the attributes of a good site, depending on cultural values. Some have preferred a hilltop site for easy defense from attack. Others have located settlements near convenient river-crossing points to facilitate communication with people in other places.

Humans have the ability to modify the characteristics of a site. Central Boston is more than twice as large today as it was during colonial times (Figure 1-15). Colonial Boston was a peninsula connected to the mainland by a very narrow neck. During the nineteenth century, a dozen major projects filled in most of the bays, coves, and marshes. A major twentieth-century landfill project created Logan Airport. Several landfill projects continue into the twenty-first century. The central areas of New York and Tokyo have also been expanded through centuries of landfilling in nearby bodies of water, substantially changing these sites.



▲ FIGURE 1-15 CHANGING SITE OF BOSTON The site of Boston has been altered by filling in much of Boston Harbor, primarily during the nineteenth century.

SITUATION

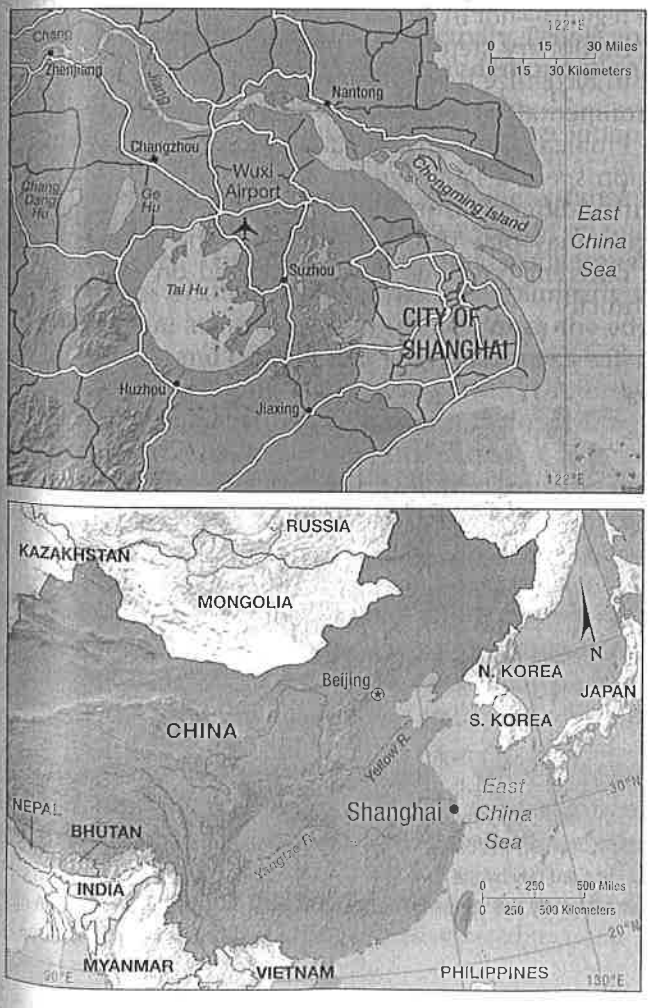
Situation is the location of a place relative to other places. Situation is a valuable way to indicate location, for two reasons—finding an unfamiliar place and understanding its importance.

First, situation helps us find an unfamiliar place by comparing its location with a familiar one. We give directions to people by referring to the situation of a place: "It's down past the courthouse, on Locust Street, after the third traffic light, beside the yellow-brick bank." We identify important buildings, streets, and other landmarks to direct people to the desired location.

Second, situation helps us understand the importance of a location. Many locations are important because they are accessible to other places. For example, because of its situation, Shanghai has become a center for the trading and distribution of goods across Asia and the Pacific Ocean (Figure 1-16). Shanghai is situated near the confluence of the Yangtze River and the East China Sea. The port of Shanghai has become the world's largest.

Pause and Reflect 1.2.1

How would you describe the site and situation of the place where you live? (Use online maps or an atlas to help analyze the characteristics of your location.)



▲ FIGURE 1-16 SITE AND SITUATION OF SHANGHAI The site of the city of Shanghai is along the south bank of Yangtze River. The situation of Shanghai, near the mouth of the Yangtze, where it flows into the East China Sea, is critical in making the city the world's largest port.

Region: A Unique Area

Learning Outcome 1.2.2
Identify the three types of regions.

The "sense of place" that humans possess may apply to a larger area of Earth rather than to a specific point. An area of Earth defined by one or more distinctive characteristics is a **region.** A particular place can be included in more than one region, depending on how the region is defined.

The designation *region* can be applied to any area larger than a point and smaller than the entire planet. Geographers most often apply the concept at one of two scales:

- Several neighboring countries that share important features, such as those in Latin America.
- Many localities within a country, such as those in southern California.

A region derives its unified character through the **cultural landscape**—a combination of cultural features such as language and religion, economic features such as agriculture and industry, and physical features such as climate and vegetation. The southern California region can be distinguished from the northern California region, for example.

The contemporary **cultural landscape approach** in geography—sometimes called the **regional studies** approach—was initiated in France by Paul Vidal de la Blache (1845–1918) and Jean Brunhes (1869–1930). It was later adopted by several American geographers, including Carl Sauer (1889–1975) and Robert Platt (1880–1950). Sauer defined cultural landscape as an area fashioned from nature by a cultural group. "Culture is the agent, the natural area the medium, the cultural landscape is the result."

People, activities, and environment display similarities and regularities within a region and differ in some way from those of other regions. A region gains uniqueness from possessing not a single human or environmental characteristic but a combination of them. Not content to merely identify these characteristics, geographers seek relationships among them. Geographers recognize that in the real world, characteristics are integrated.

Geographers identify three types of regions—formal, functional, and vernacular.

FORMAL REGION

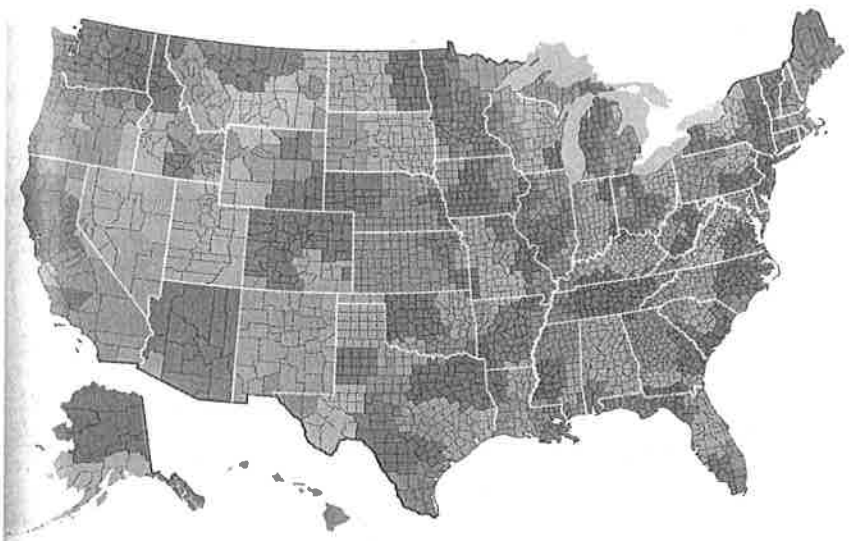
A **formal region,** also called a **uniform region,** is an area within which everyone shares in common one or more distinctive characteristics. The shared feature could be a cultural value such as a common language, an economic activity such as production of a particular crop, or an environmental property such as climate. In a formal region, the selected characteristic is present throughout.

Some formal regions are easy to identify, such as countries or local government units. Montana is an example of a formal region, characterized with equal intensity throughout the state by a government that passes laws, collects taxes, and issues license plates. The formal region of Montana has clearly drawn and legally recognized boundaries, and everyone living within them shares the status of being subject to a common set of laws.

In other kinds of formal regions, a characteristic may be predominant rather than universal. For example, we can distinguish formal regions within the United States characterized by a predominant voting for Republican candidates, although Republicans do not get 100 percent of the votes in these regions—nor in fact do they always win (Figure 1-17).

A cautionary step in identifying formal regions is the need to recognize the diversity of cultural, economic, and environmental factors, even while making a generalization. Problems may arise because a minority of people in a region speak a language, practice a religion, or possess resources different from those of the majority. People in a region may play distinctive roles in the economy and hold different positions in society based on their gender or ethnicity.

▲ **FIGURE 1-17 FORMAL REGIONS** The three maps show the winner by region in the (left) 2004, (center) 2008, and (right) 2012 presidential elections. The extensive areas of support for Democrats (blue) and Republicans (red) are examples of formal regions. (left) In 2004, Democrat John Kerry won most of the states in the Northeast, Upper Midwest, and Pacific Coast regions, while Republican George W. Bush won the remaining regions. (center) In 2008, Democrat Barack Obama won the election by capturing some states in regions that had been won entirely by the Republican four years earlier. (right) In 2012, Democrat Obama won reelection because he carried nearly the same states as four years earlier.



◀ **FIGURE 1-18 FUNCTIONAL REGIONS** The United States is divided into functional regions based on television markets, which are groups of counties served by a collection of TV stations. Many of these TV market functional regions cross state lines.

UNCTIONAL REGION

functional region, also called a **nodal region**, is an area rganized around a node or focal point. The characteristic hosen to define a functional region dominates at a cenal focus or node and diminishes in importance outward. he region is tied to the central point by transportation r communications systems or by economic or functional ssociations.

Geographers often use functional regions to display inormation about economic areas. A region's node may be a hop or service, with the boundaries of the region marking he limits of the trading area of the activity. People and acivities may be attracted to the node, and information may low from the node to the surrounding area.

An example of a functional region is the reception area of a TV station. A TV station's signal is strongest at the center of its service area (Figure 1-18). At some distance from the center, more people are watching a station originating in another city. That place is the boundary between the nodal regions of the two TV market areas. Similarly, a department store attracts fewer customers from the edge of a trading area, and beyond that edge, customers will most likely choose to shop elsewhere.

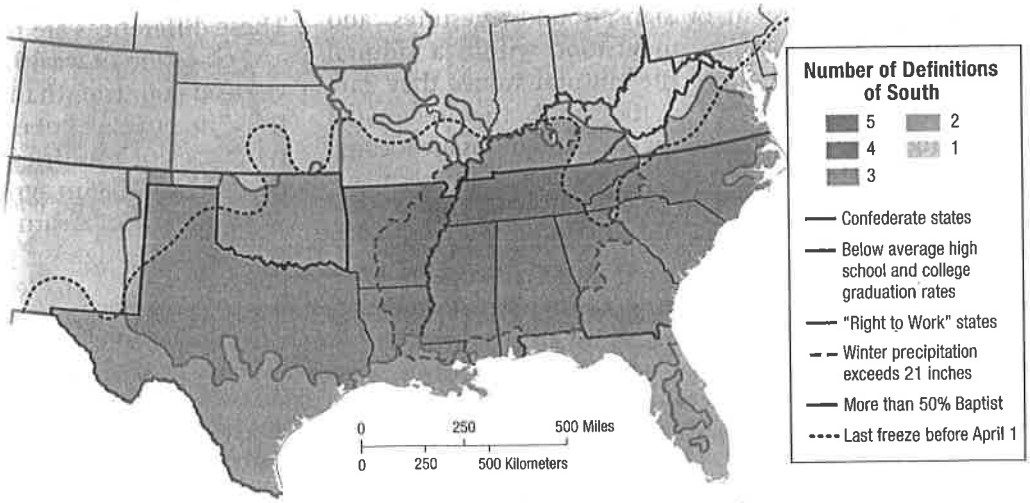
New technology is breaking down traditional functional regions. TV stations are broadcast to distant places by cable, satellite, or Internet and through the Internet customers can shop at distant stores.

VERNACULAR REGION

A **vernacular region**, or **perceptual region**, is an area that people believe exists as part of their cultural identity. Such regions emerge from people's informal sense of place rather than from scientific models developed through geographic thought.

A useful way to identify a perceptual region is to get someone to draw a **mental map**, which is an internal representation of a portion of Earth's surface. A mental map depicts what an individual knows about a place, containing personal impressions of what is in the place and where the place is located. On a college campus, a senior is likely to have a more detailed and "accurate" map than a first-year student.

As an example of a vernacular region, Americans frequently refer to the South as a place with environmental, cultural, and economic features perceived to be quite distinct from those of the rest of the United States (Figure 1-19). Many of these features can be measured. Economically, the South is a region of high cotton production and low high school graduation rates. Culturally, the South includes the states that joined the Confederacy during the Civil War and where Baptist is the most prevalent religious denomination. Environmentally, the South is a region where the last winter frost occurs in March, and rainfall is more plentiful in winter than in summer. Southerners and other Americans alike share a strong sense of the American South as a distinctive place that transcends geographic measurement. The perceptual region known as the South is a source of pride to many Americans—and for others it is a place to avoid.



▶ **FIGURE 1-19 VERNACULAR REGIONS** The South is popularly distinguished as a distinct vernacular region within the United States, according to a number of factors, such as mild climate, propensity for growing cotton, and importance of the Baptist Church.

REGIONS OF CULTURE

Learning Outcome 1.2.3
Describe two geographic definitions of culture.

In thinking about *why* each region on Earth is distinctive, geographers refer to **culture**, which is the body of customary beliefs, material traits, and social forms that together constitute the distinct tradition of a group of people. Geographers distinguish groups of people according to important cultural characteristics, describe where particular cultural groups are distributed, and offer reasons to explain the observed distribution.

In everyday language, we think of *culture* as the collection of novels, paintings, symphonies, and other works produced by talented individuals. A person with a taste for these intellectual outputs is said to be "cultured." Intellectually challenging culture is often distinguished from *popular* culture, such as TV. *Culture* also refers to small living organisms, such as those found under a microscope or in yogurt. *Agriculture* is a term for the growing of living material at a much larger scale than in a test tube.

The origin of the word *culture* is the Latin *cultus*, which means "to care for." Culture is a complex concept because "to care for" something has two very different meanings:

- To care *about*—to adore or worship something, as in the modern word *cult*
- To take care *of*—to nurse or look after something, as in the modern word *cultivate*

Geography looks at both of these facets of the concept of culture to see why each region in the world is unique.

CULTURE: WHAT PEOPLE CARE ABOUT. Geographers study why the customary ideas, beliefs, and values of a people produce a distinctive culture in a particular place. Especially important cultural values derive from a group's language, religion, and ethnicity. These three cultural traits are both an excellent way of identifying the location of a culture and the principal means by which cultural values become distributed around the world.

Language is a system of signs, sounds, gestures, and marks that have meanings understood within a cultural group. People communicate the cultural values they care about through language, and the words themselves tell something about where different cultural groups are located (Figure 1-20). The distribution of speakers of different languages and reasons for the distinctive distribution are discussed in Chapter 5.

Religion is an important cultural value because it is the principal system of attitudes, beliefs, and practices through which people worship in a formal, organized way. As discussed in Chapter 6, geographers look at the distribution of religious groups around the world and the different ways that the various groups interact with their environment.

Ethnicity encompasses a group's language, religion, and other cultural values, as well as its physical traits. A group possesses these cultural and physical characteristics as a product of its common traditions and heredity. As addressed in Chapter 7, geographers find that problems of conflict and inequality tend to occur in places where more than one ethnic group inhabits and seeks to organize the same territory.

▲ **FIGURE 1-20 CULTURE: WHAT PEOPLE CARE ABOUT** Language and religion are important elements of culture that people care about. These tiles in French and Vietnamese are in the Basilica of Our Lady of the Immaculate Conception (Notre-Dame Basilica) in Ho Chi Minh City, Vietnam. When the basilica was constructed in the late nineteenth century, France was the colonial ruler of Vietnam. "Ta ón Thánh Antôn" is Vietnamese for "Thanks to Saint Anthony" (the patron saint of lost and stolen items).

CULTURE: WHAT PEOPLE TAKE CARE OF. The second element of culture of interest to geographers is production of material wealth—the food, clothing, and shelter that humans need in order to survive and thrive. All people consume food, wear clothing, build shelter, and create art, but different cultural groups obtain their wealth in different ways.

Geographers divide the world into regions of developed countries and regions of developing countries. Various shared characteristics—such as per capita income, literacy rates, TVs per capita, and hospital beds per capita—distinguish developed regions and developing regions. These differences are reviewed in Chapter 9.

Possession of wealth and material goods is higher in developed countries than in developing countries because of the different types of economic activities carried out in the two types of countries. Most people in developing countries are engaged in agriculture, whereas most people in developed countries earn their living through performing services in exchange for wages. This fundamental economic difference between developed and developing regions is discussed in more detail in Chapters 10 through 13.

SPATIAL ASSOCIATION

A region can be constructed to encompass an area of widely varying scale, from a very small portion of Earth to a very large portion. Different conclusions may be reached

concerning a region's characteristics, depending on its scale. Consider the percentage of Americans who die each year from cancer. Death rates vary widely among scales within the United States (Figure 1-21):

- At the scale of the United States, the Great Lakes and South regions have higher levels of cancer than the West.
- At the scale of the state of Maryland, the eastern region has a higher level of cancer than the western region.
- At the scale of the city of Baltimore, Maryland, lower levels of cancer are found in the northern region.

To explain why regions possess distinctive features, such as a high cancer rate, geographers try to identify cultural, economic, and environmental factors that display similar spatial distributions. By integrating other spatial information about people, activities, and environments, we can begin to see factors that may be associated with regional differences in cancer:

- At the national scale, the Great Lakes region may have higher cancer rates in part because the distribution of cancer is spatially associated with the distribution of factories.
- At the state scale, Baltimore City may have higher cancer rates because of a concentration of people with lower levels of income and education. People living in the rural Eastern Shore region may be exposed to runoff of chemicals from farms into the nearby Chesapeake Bay, as well as discharges carried by prevailing winds from factories further west.
- At the urban scale, neighborhoods on the north side of Baltimore City contain a higher percentage of people with high incomes and are further from the city's factories and port facilities.

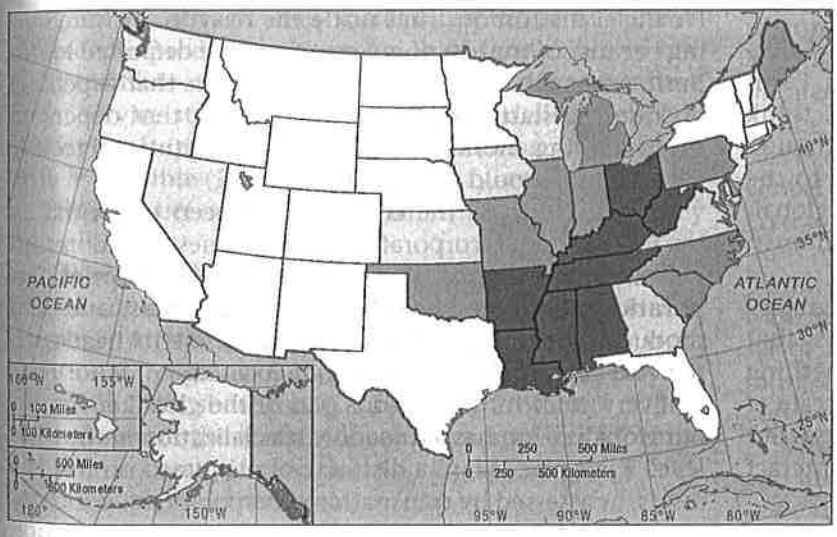
Pause and Reflect 1.2.3

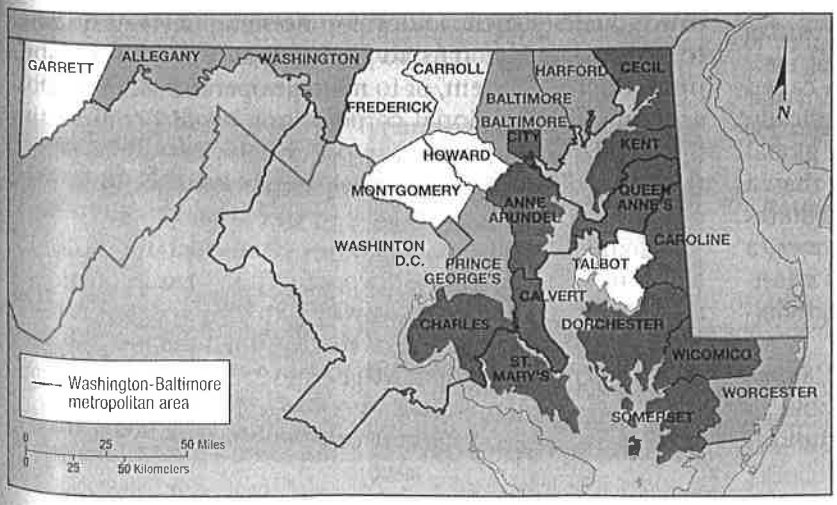
For each map in Figure 1-21, write a question that you could ask about the data on the map at that scale. How do your questions change as the map's scale changes?

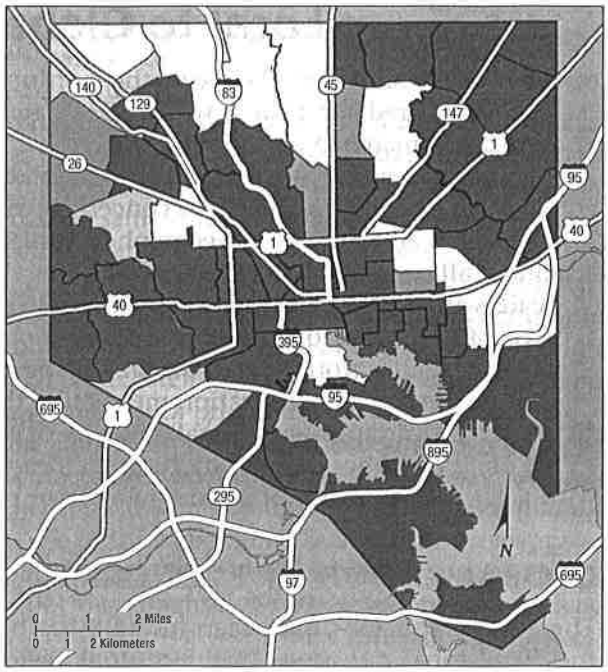
CHECK-IN: KEY ISSUE 2

Why Is Each Point On Earth Unique?

- ✓ **Location is identified through name, site, and situation.**
- ✓ **Regions can be formal, functional, or vernacular.**
- ✓ **Culture encompasses what people care about and what people take care of.**







Deaths from cancer per 100,000 people
- 200 and above
- 190–199
- 180–189
- Below 180

▲ **FIGURE 1-21 SPATIAL ASSOCIATION** On the national scale, the Great Lakes and South regions have higher cancer rates than the West. On the scale of the state of Maryland, the eastern region has a higher cancer rate than the western region. On the urban scale, southern and western neighborhoods of Baltimore City have higher cancer rates than northwestern ones. Geographers try to understand the reason for such variations.

KEY ISSUE 3

Why Are Different Places Similar?

Scale: From Local to Global
Space: Distribution of Features
Connections between Places

Learning Outcome 1.3.1
Give examples of changes in economy and culture occurring at global and local scales.

Although accepting that each place or region on Earth may be unique, geographers recognize that human activities are rarely confined to one location. Three basic concepts—scale, space, and connections—help geographers explain why similarities among places and regions do not result from coincidence.

Scale: From Local to Global

Scale is the relationship between the portion of Earth being studied and Earth as a whole. Geographers think about scale at many levels, from local to global. Although geographers study every scale from the individual to the entire Earth, increasingly they are concerned with global-scale patterns and processes. Geographers explain human actions at all scales, from local to global.

Scale is an increasingly important concept in geography because of **globalization**, which is a force or process that involves the entire world and results in making something worldwide in scope. Globalization means that the scale of the world is shrinking—not literally in size, of course, but in the ability of a person, an object, or an idea to interact with a person, an object, or an idea in another place.

GLOBALIZATION OF ECONOMY

The severe recession that began in 2008 has been called the first global recession. Past recessions were typically confined to one country or region. In contrast, the global economy declined in 2009 for the first time in more than a half-century. The fate of a home buyer in the United States was tied to the fate of a banker in the United Kingdom, a sales clerk in Japan, a clothing maker in China, and a construction worker in Nigeria. All were caught in a global-scale web of falling demand and lack of credit.

The global financial crisis began in the United States and Europe with the bursting of the housing bubble. A **housing bubble** is a rapid increase in the value of houses followed by a sharp decline in their value. Housing prices had risen very rapidly for a number of years, primarily because very low interest rates made it possible for more people to borrow more money to buy more houses:

- Poorer people bought houses for the first time because financial institutions were willing to lend them money even though they were at a high risk of not being able to repay the debt.
- Wealthy people bought second and third homes as investments, taking advantage of the low rates for borrowing money. They were betting that prices would continue to escalate, enabling them to resell the houses at a profit. The wealthy also invested money in funds that directly or indirectly provided the loans to high-risk people.
- The government encouraged low-income families to buy houses even though they were at risk of not repaying the loans. Less government regulation and oversight of the financial industry made it easier for abusive practices to occur.

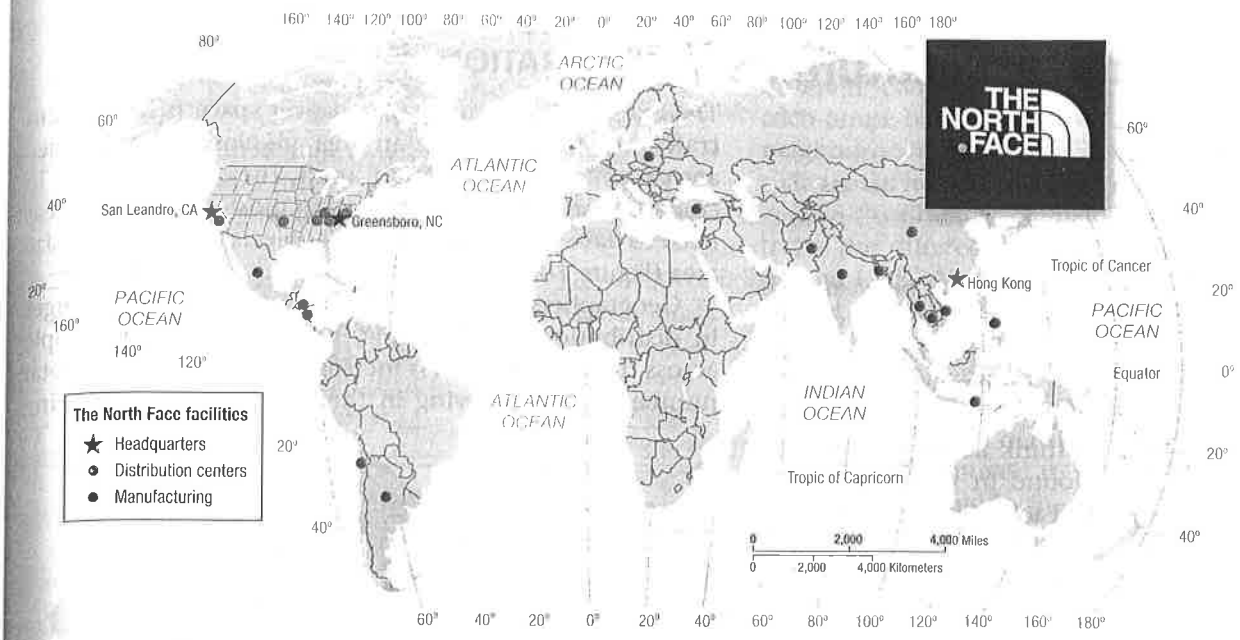
Declining demand for housing led to falling prices. Many people owed more on their houses than the houses were now worth if they tried to sell them. Ultimately, many defaulted on their loans and walked away from the houses, leaving them vacant and derelict.

The crisis spread from housing through the economy. Financial institutions that made the risky loans were failing because of the loss of revenue from the defaulted loans. Businesses such as furniture and electronics that depended on housing started to fail. Manufacturers that depended on borrowing money from financial institutions to buy raw materials could no longer get loans.

Globalization of the economy has been led primarily by transnational corporations, sometimes called multinational corporations (Figure 1-22). A **transnational corporation** conducts research, operates factories, and sells products in many countries, not just where its headquarters and principal shareholders are located.

Every place in the world is part of the global economy, but globalization has led to more specialization at the local level. Each place plays a distinctive role, based on its local assets, as assessed by transnational corporations. A locality may be especially suitable for a transnational corporation to conduct research, to develop new engineering systems, to extract raw materials, to produce parts, to store finished products, to sell them, or to manage operations. In a global economy, transnational corporations remain competitive by correctly identifying the optimal location for each of these activities. Factories are closed in some locations and opened in others.

Changes in production have led to a spatial division of labor, in which a region's workers specialize in particular tasks. Transnationals decide where to produce things in response to characteristics of the local labor force, such as level of skills, prevailing wage rates, and attitudes toward unions. Transnationals may close factories in locations with high wage rates and strong labor unions.



▲ **FIGURE 1-22 GLOBALIZATION OF ECONOMY** Most North Face clothing is manufactured in Latin America and Asia. The company's headquarters is in San Leandro, California, the headquarters of its parent VF Corporation is in Greensboro, North Carolina, and manufacturing is managed from its Hong Kong office.

GLOBALIZATION OF CULTURE

Geographers observe that increasingly uniform cultural preferences produce uniform "global" landscapes of material artifacts and of cultural values. Fast-food restaurants, service stations, and retail chains deliberately create a visual appearance that varies among locations as little as possible (Figure 1-23). That way, customers know what to expect, regardless of where in the world they happen to be.

Underlying the uniform cultural landscape is globalization of cultural beliefs and forms, especially religion and language. Africans, in particular, have moved away from traditional religions and have adopted Christianity or Islam, religions shared with hundreds of millions of people throughout the world. Globalization requires a form of common communication, and the English language is increasingly playing that role.

As more people become aware of elements of global culture and aspire to possess them, local cultural beliefs, forms, and traits are threatened with extinction. The survival of a local culture's distinctive beliefs, forms, and traits may be threatened by interaction with such social customs as wearing jeans and Nike shoes, consuming Coca-Cola and McDonald's hamburgers, and communicating using cell phones and computers.

Yet despite globalization, cultural differences among places not only persist but actually flourish in many places. Global standardization of products does not mean that everyone wants the same cultural products. The communications revolution that promotes globalization of culture also permits preservation of cultural diversity. TV, for example, was once limited to a handful of channels displaying one set of cultural values. With the distribution of programming through cable, satellite, and Internet, people now can choose from hundreds of programs in many languages.

With the globalization of communications, people in two distant places can watch the same TV program. At the same time, with the fragmentation of the broadcasting market, two people in the same house can watch different programs. Groups of people on every continent may aspire to wear jeans, but they might live with someone who prefers skirts. In a global culture, companies can target groups of consumers with similar tastes in different parts of the world.

Pause and Reflect 1.3.1

Give examples from your own community of (a) a cultural element that is local and (b) a cultural element that reflects the globalization of culture.

CHINA

DUBAI

◀ **FIGURE 1-23 GLOBALIZATION OF CULTURE** McDonald's has more than 32,000 restaurants in 117 countries. To promote global uniformity of its restaurants, the company erects signs around the world that include two golden arches.

Space: Distribution of Features

Learning Outcome 1.3.2
Identify the three properties of distribution across space.

Space refers to the physical gap or interval between two objects. Geographers observe that many objects are distributed across space in a regular manner, for discernible reasons. Spatial thinking is the most fundamental skill that geographers possess to understand the arrangement of objects across Earth. Geographers think about the arrangement of people and activities found in space and try to understand why those people and activities are distributed across space as they are.

Look around the space you currently occupy—perhaps a classroom or a bedroom. Tables and chairs are arranged regularly, perhaps in a row in a classroom or against a wall at home. The room is located in a building that occupies an organized space—along a street or a side of a quadrangle. Similarly, the community containing the campus or house is part of a system of communities arranged across the country and around the world.

Geographers explain how features such as buildings and communities are arranged across Earth. On Earth as a whole, or within an area of Earth, features may be numerous or scarce, close together or far apart. The arrangement of a feature in space is known as its **distribution.** Geographers identify three main properties of distribution across Earth—density, concentration, and pattern.

DISTRIBUTION PROPERTIES: DENSITY

Density is the frequency with which something occurs in space. The feature being measured could be people, houses, cars, trees, or anything else. The area could be measured in square kilometers, square miles, hectares, acres, or any other unit of area.

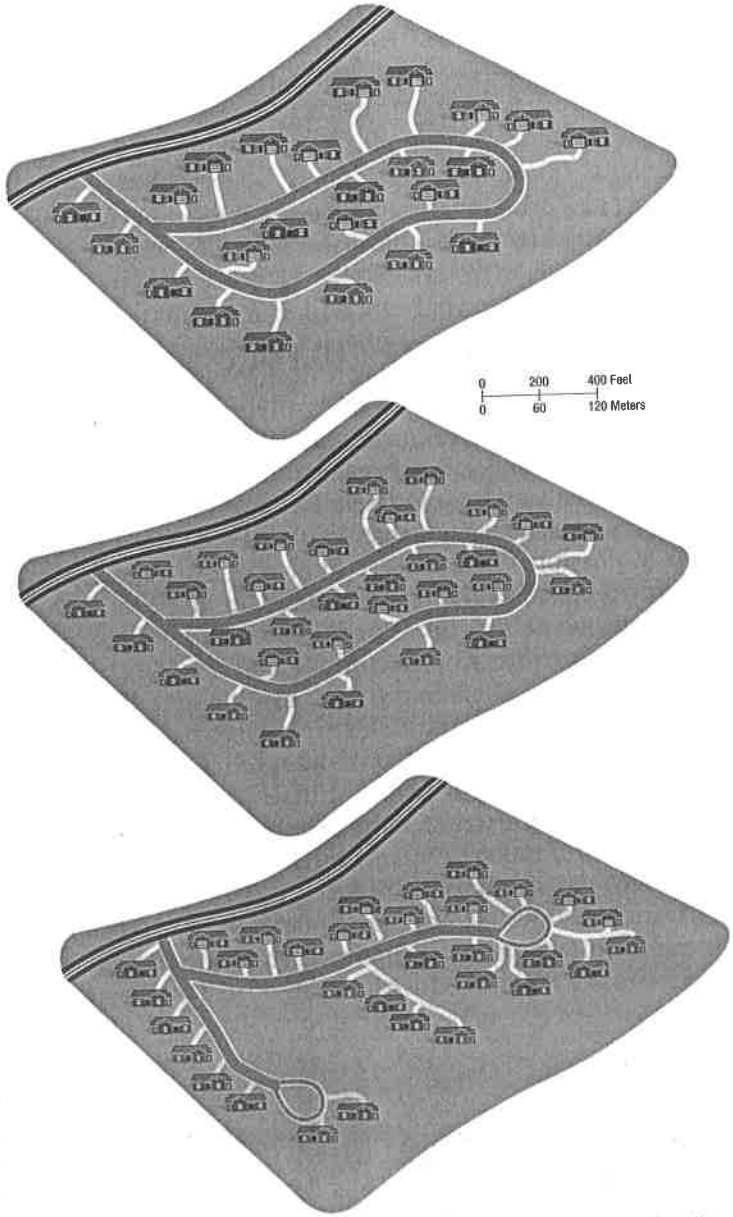
Remember that a large number of a feature does not necessarily lead to a high density. Density involves two measures—the number of a feature and the land area. China is the country with the largest number of people—approximately 1.4 billion—but it does not have the world's highest density. The Netherlands, for example, has only 17 million people, but its density of 400 persons per square kilometer is much higher than China's 140 persons per square kilometer. The reason is that the land area of China is 9.6 million square kilometers, compared to only 37,000 square kilometers for the Netherlands.

High population density is also unrelated to poverty. The Netherlands is one of the world's wealthiest countries, and Mali one of the world's poorest. Yet the Netherlands' density of 400 persons per square kilometer is much larger than Mali's density of 12 persons per square kilometer (see Chapter 2 for more about density).

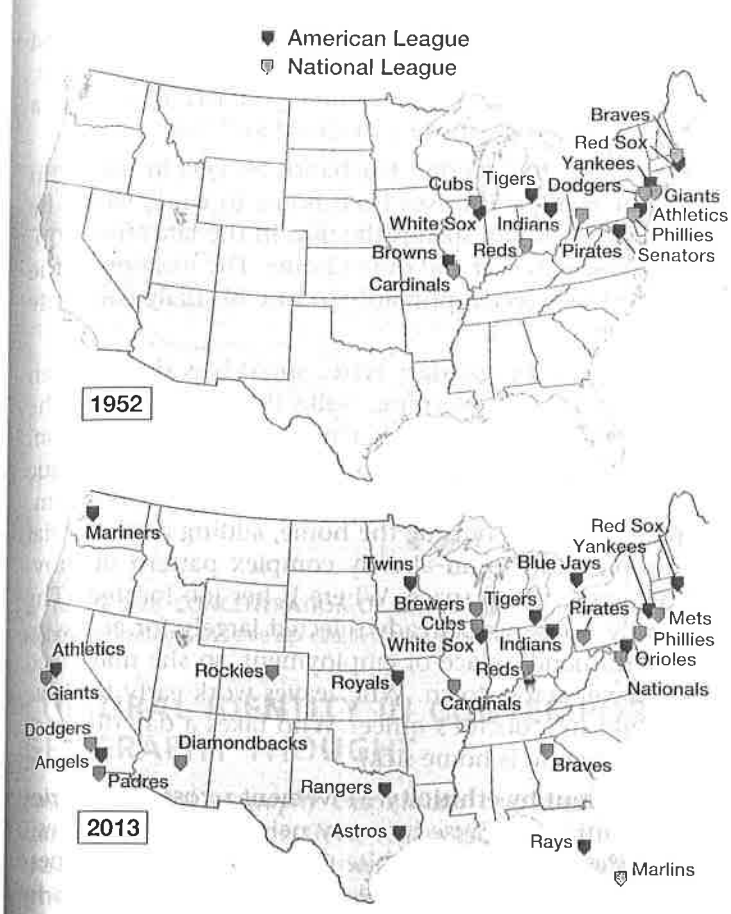
DISTRIBUTION PROPERTIES: CONCENTRATION

The extent of a feature's spread over space is its **concentration.** If the objects in an area are close together, they are *clustered*; if relatively far apart, they are *dispersed*. To compare the level of concentration most clearly, two areas need to have the same number of objects and the same size area (Figure 1-24).

Geographers use concentration to describe changes in distribution. For example, the distribution of people across the United States is increasingly dispersed. The total number of people living in the United States is growing



▲ **FIGURE 1-24 DISTRIBUTION OF HOUSES** The top plan for a residential area has a lower density than the middle plan (24 houses compared to 32 houses on the same 82-acre piece of land), but both have dispersed concentrations. The middle and lower plans have the same density (32 houses on 82 acres), but the distribution of houses is more clustered in the lower plan. The lower plan has shared open space, whereas the middle plan provides a larger, private yard surrounding each house.



▲ **FIGURE 1-25 DISTRIBUTION OF BASEBALL TEAMS** The changing distribution of North American baseball teams illustrates the difference between density and concentration.

slowly—less than 1 percent per year—and the land area is essentially unchanged. But the population distribution is changing from relatively clustered in the Northeast to more evenly dispersed across the country.

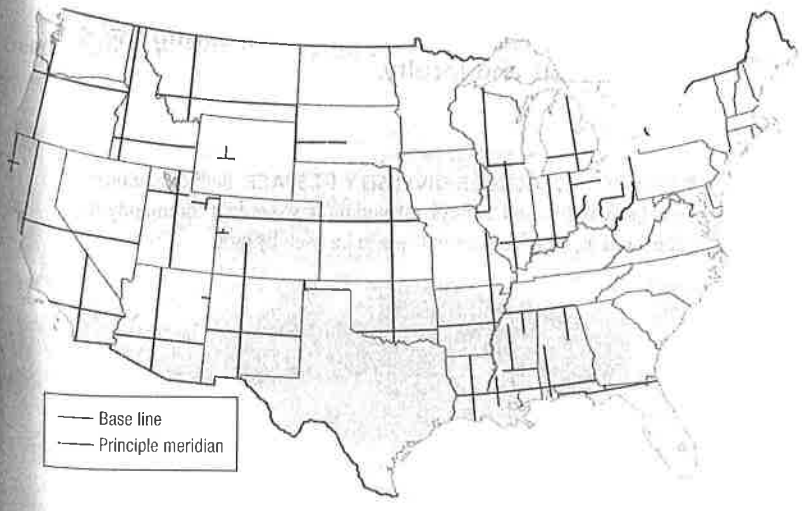
Concentration is not the same as density. Two neighborhoods could have the same density of housing but different concentrations. In a dispersed neighborhood, each house has a large private yard, whereas in a clustered neighborhood, the houses are close together and the open space is shared as a community park.

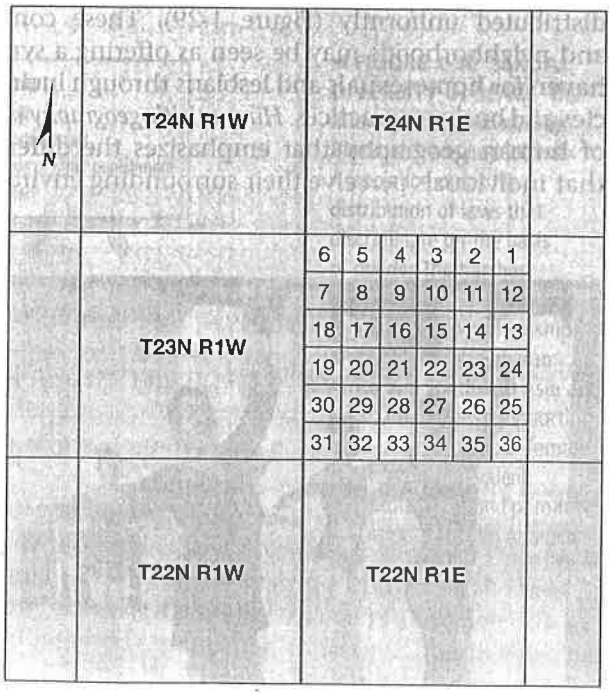
The distribution of major-league baseball teams illustrates the difference between density and concentration (Figure 1-25). After remaining unchanged during the first half of the twentieth century, the distribution of major-league baseball teams changed during the second half of the twentieth century. The major leagues expanded from 16 to 30 teams in North America between 1960 and 1998, thus increasing the density. At the same time, 6 of the 16 original teams moved to other locations. In 1952, every team was clustered in the Northeast United States, but the moves dispersed several teams to the West Coast and Southeast. These moves, as well as the spaces occupied by the expansion teams, resulted in a more dispersed distribution.

DISTRIBUTION PROPERTIES: PATTERN

The third property of distribution is **pattern**, which is the geometric arrangement of objects in space. Some features are organized in a geometric pattern, whereas others are distributed irregularly. Geographers observe that many objects form a linear distribution, such as the arrangement of houses along a street or stations along a subway line.

Objects are frequently arranged in a square or rectangular pattern. Many American cities contain a regular pattern of streets, known as a grid pattern, which intersect at right angles at uniform intervals to form square or rectangular blocks. The system of townships, ranges, and sections established by the Land Ordinance of 1785 is another example of a square or grid pattern (Figure 1-26).





▲ **FIGURE 1-26 PATTERN: TOWNSHIP AND RANGE** (left) To facilitate the numbering of townships, the U.S. Land Ordinance of 1785 designated several north–south lines as principal meridians and several east–west lines as base lines. (right) As territory farther west was settled, additional lines were delineated. Townships are typically 6 miles by 6 miles.

CULTURAL IDENTITY IN SPACE

Learning Outcome 1.3.3

Describe different ways in which geographers approach aspects of cultural identity such as gender, ethnicity, and sexuality.

Patterns in space vary according to gender, ethnicity, and sexuality. Geographers study these cultural traits because they are important in explaining why people sort themselves out in space and move across the landscape in distinctive ways. Critical geographers are especially concerned with the way in which the movement across space and the resulting distribution of activities perpetuate traditional roles of gender, ethnicity, and sexuality.

DISTRIBUTION ACROSS SPACE. The importance of space is learned as a child. Which child—the boy or girl—went to Little League and which went to ballet lessons? To which activity is substantially more land allocated in a city—ballfields or dance studios? (See Figure 1-27.) Space may be designed to appeal to a particular cultural group—or repel that group. A bar that appeals to whites may be uncomfortable for persons of color. A park that attracts African Americans may be uncomfortable for whites. One person's haven may generate fear for safety in others. *Behavioral geography* is a branch of human geography that emphasizes the importance of understanding the psychological basis for individual human actions.

Openly homosexual men and lesbian women may be attracted to some locations to reinforce spatial interaction with other gays. Some communities have relatively high concentrations of same-sex couples (Figure 1-28). Similarly, within communities that attract a concentration of gays, businesses that appeal primarily to gays may not be distributed uniformly (Figure 1-29). These communities and neighborhoods may be seen as offering a sympathetic haven for homosexuals and lesbians through inclusive policies and business practices. *Humanisitic geography* is a branch of human geography that emphasizes the different ways that individuals perceive their surrounding environment.

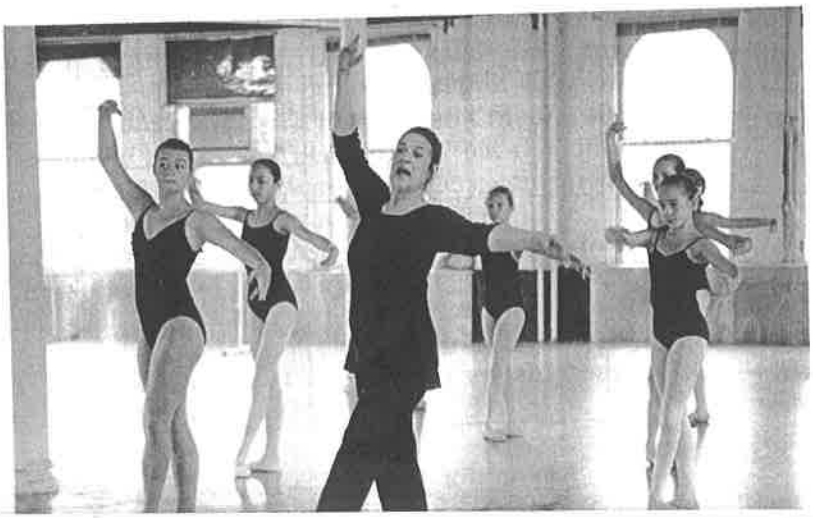
MOVEMENT ACROSS SPACE. Traditional roles and relationships influence how people move across space. For example, consider the spatial patterns typical of a household that consists of a husband and wife:

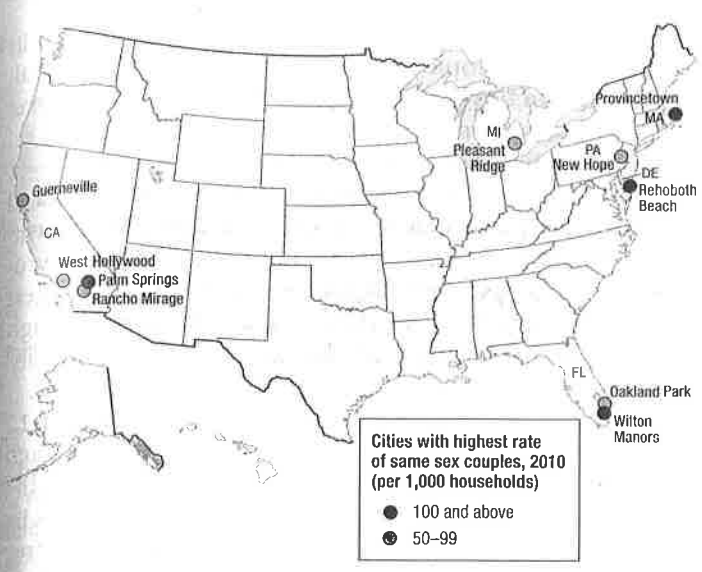
- **Movement by gender: Husband.** He gets in his car in the morning and drives from home to work, where he parks the car and spends the day. In the late afternoon, he collects the car and drives home. The location of the home was selected primarily to ease his daily commute to work.
- **Movement by gender: Wife.** She drives the children to school in the morning, walks the dog, drives to the supermarket, and visits her mother. In the afternoon, she drives the children from school to Little League or ballet lessons. Most American women are now employed at work outside the home, adding a substantial complication to an already complex pattern of moving across urban space. Where is her job located? The family house was already selected largely for access to her husband's place of employment, so she may need to travel across town. Who leaves work early to drive a child to a doctor's office? Who takes a day off work when a child is home sick?
- **Movement by ethnicity.** Movement across space varies by ethnicity because in many neighborhoods the residents are virtually all white people or virtually all persons of color. For example, most African Americans in Dayton, Ohio, live on the west side, whereas the east side is home to a virtually all-white population. As a result, when office workers are heading home from downtown Dayton, persons of color are driving or waiting for buses on the westbound streets, whereas whites are moving on the eastbound streets.

Pause and Reflect 1.3.3

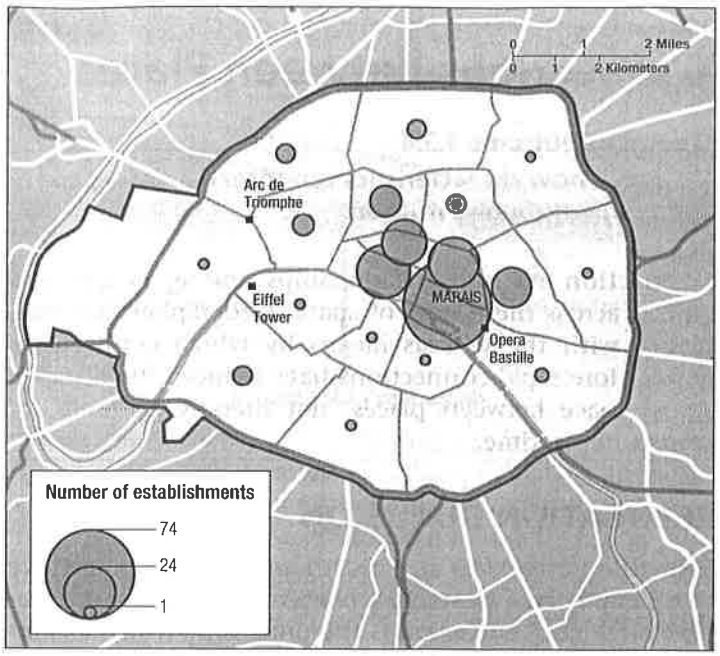
Using your own campus as the example, describe how movement across space varies during the day for students and faculty.

▼ **FIGURE 1-27 GENDER DIVERSITY IN SPACE** Ballfields, which are more likely to be used by boys, take up more space in a community than ballet studios, which are more likely to be used by girls.





▲ **FIGURE 1-28 CONCENTRATION OF GAYS** These 10 cities have the highest percentages of same-sex couples living together.



▲ **FIGURE 1-29 GAY-ORIENTED BUSINESSES IN PARIS** In Paris, 140 businesses appealing primarily to gays were identified through four 2004 guidebooks for gay travelers and residents. Gay-oriented businesses were found to be highly clustered in the Marais district of central Paris.

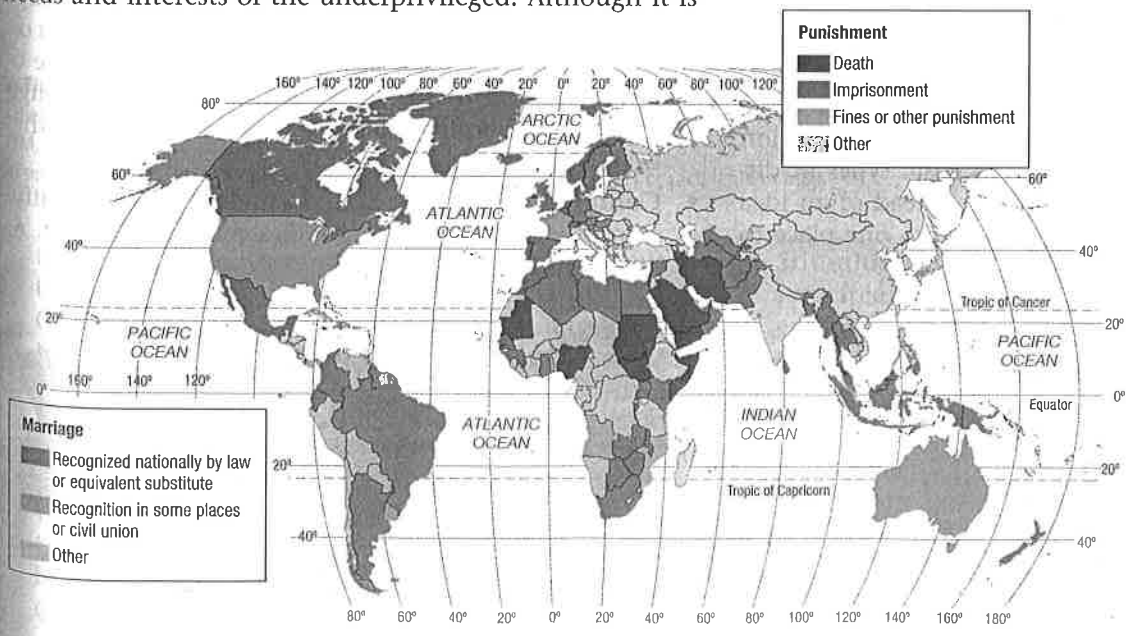
CULTURAL IDENTITY IN CONTEMPORARY GEOGRAPHY THOUGHT

Poststructuralist geography emphasizes the need to understand multiple perspectives regarding space. The experiences of women differ from those of men, blacks from whites, and gays from straights. It is important to listen to and to record what different groups have to say about their environment.

Cultural groups compete to organize space. Poststructuralist geographers are especially concerned with cultural groups that are dominated in space, especially women, ethnic minorities, and gays, as well as confrontations that result from the domination. Distinctive spatial patterns by gender, race, and sexual orientation are constructed by the attitudes and actions of others.

Critical geographers use their studies to focus on the needs and interests of the underprivileged. Although it is illegal to discriminate against people of color, spatial segregation persists. In many places in the world, it is legal to discriminate against gays (Figure 1-30).

All academic disciplines and workplaces have proclaimed sensitivity to issues of cultural diversity. For geographers, concern for cultural diversity is not merely a politically correct expediency; it lies at the heart of geography's spatial tradition. Nor is geographers' deep respect for the dignity of all cultural groups merely a matter of political correctness; it lies at the heart of geography's understanding of space.



◀ **FIGURE 1-30 SEXUAL DIVERSITY IN SPACE** The International Lesbian, Gay, Bisexual, Trans and Intersex Association maps the distribution of laws that discriminate on the basis of gender. The harshest laws against male–male or female–female relationships are found in sub-Saharan Africa and Southwest Asia and North Africa. Laws supporting male–male or female–female marriage or equivalent substitute are found primarily in Europe and Latin America.

Connections between Places

Learning Outcome 1.3.4
Describe how characteristics can spread across space over time through diffusion.

Connection refers to relationships among people and objects across the barrier of space. Geographers are concerned with the various means by which connections occur. More rapid connections have reduced the distance across space between places, not literally in miles, of course, but in time.

RELOCATION DIFFUSION

Something originates at a hearth and diffuses from there to other places. A **hearth** is a place from which an innovation originates. **Diffusion** is the process by which a characteristic spreads across space from one place to another over time. Geographers document the location of nodes and the processes by which diffusion carries things elsewhere over time.

How does a hearth emerge? A cultural group must be willing to try something new and must be able to allocate resources to nurture the innovation. To develop a hearth, a group of people must also have the technical ability to achieve the desired idea and the economic structures, such as financial institutions, to facilitate implementation of the innovation.

As discussed in subsequent chapters, geographers can trace the dominant cultural, political, and economic features of the contemporary United States and Canada primarily to hearths in Europe and the Middle East. Other regions of the world also contain important hearths. In some cases an idea, such as an agricultural practice, may originate independently in more than one hearth. In other cases, hearths may emerge in two regions because two cultural groups modify a shared concept in two different ways.

For a person, an object, or an idea to have interaction with persons, objects, or ideas in other regions, diffusion must occur. Geographers observe two basic types of diffusion—relocation and expansion. The spread of an idea through physical movement of people from one place to another is termed **relocation diffusion**. We shall see in Chapter 3 that people migrate for a variety of political, economic, and environmental reasons. When they move, they carry with them their culture, including language, religion, and ethnicity.

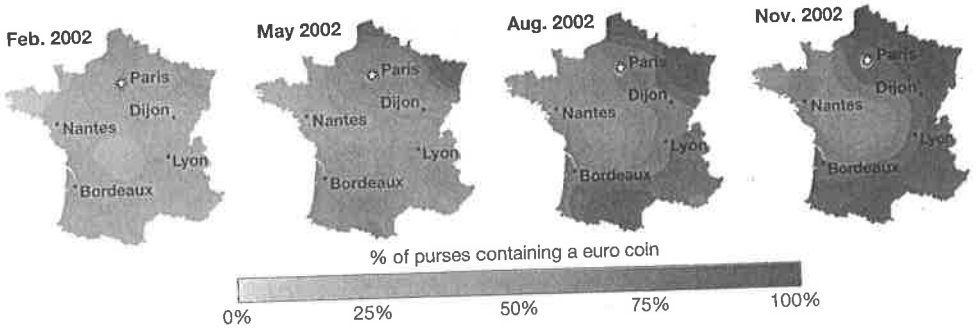
The most commonly spoken languages in North and South America are Spanish, English, French, and Portuguese, primarily because several hundred years ago Europeans who spoke those languages comprised the largest number of migrants. Thus these languages spread through relocation diffusion. We will examine the diffusion of languages, religions, and ethnicity in Chapters 5 through 7.

Introduction of a common currency, the euro, in 12 European countries in 2002 gave scientists an unusual opportunity to measure relocation diffusion from hearths (Figure 1-31). Although a single set of paper money was issued, each of the 12 countries minted its own coins in proportion to its share of the region's economy. A country's coins were initially distributed only inside its borders, although the coins could also be used in the other 11 countries. Scientists in France took month-to-month samples to monitor the proportion of coins from each of the other 11 countries. The percentage of coins from a particular country is a measure of the level of relocation diffusion to and from France.

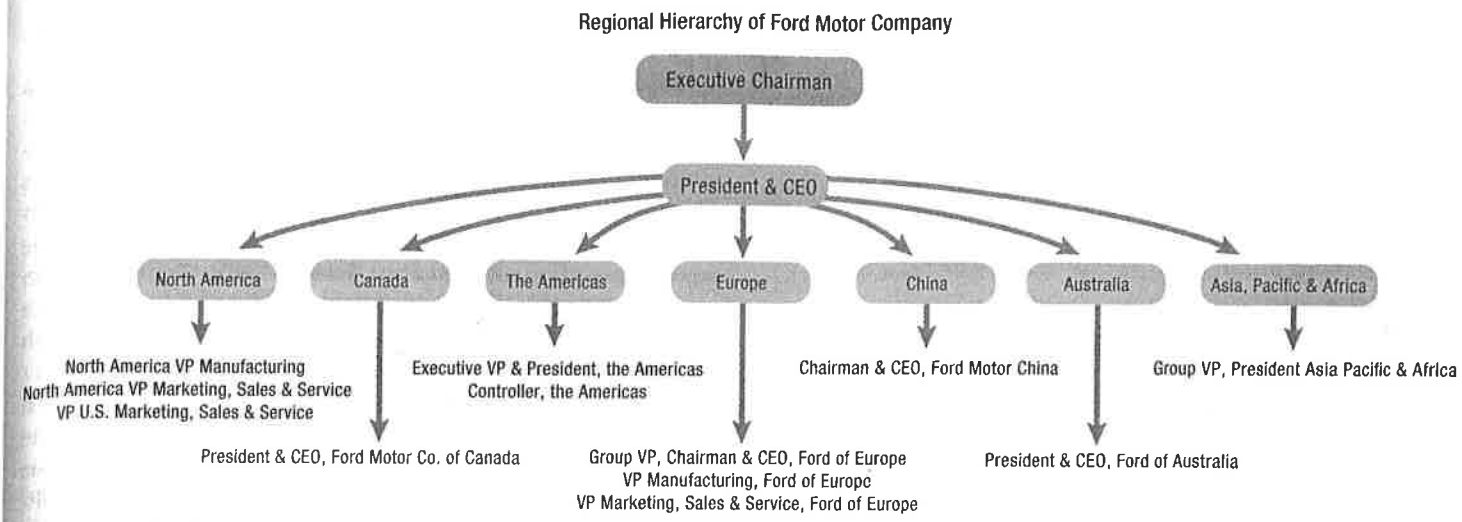
EXPANSION DIFFUSION

The spread of a feature from one place to another in an additive process is **expansion diffusion.** This expansion may result from one of three processes:

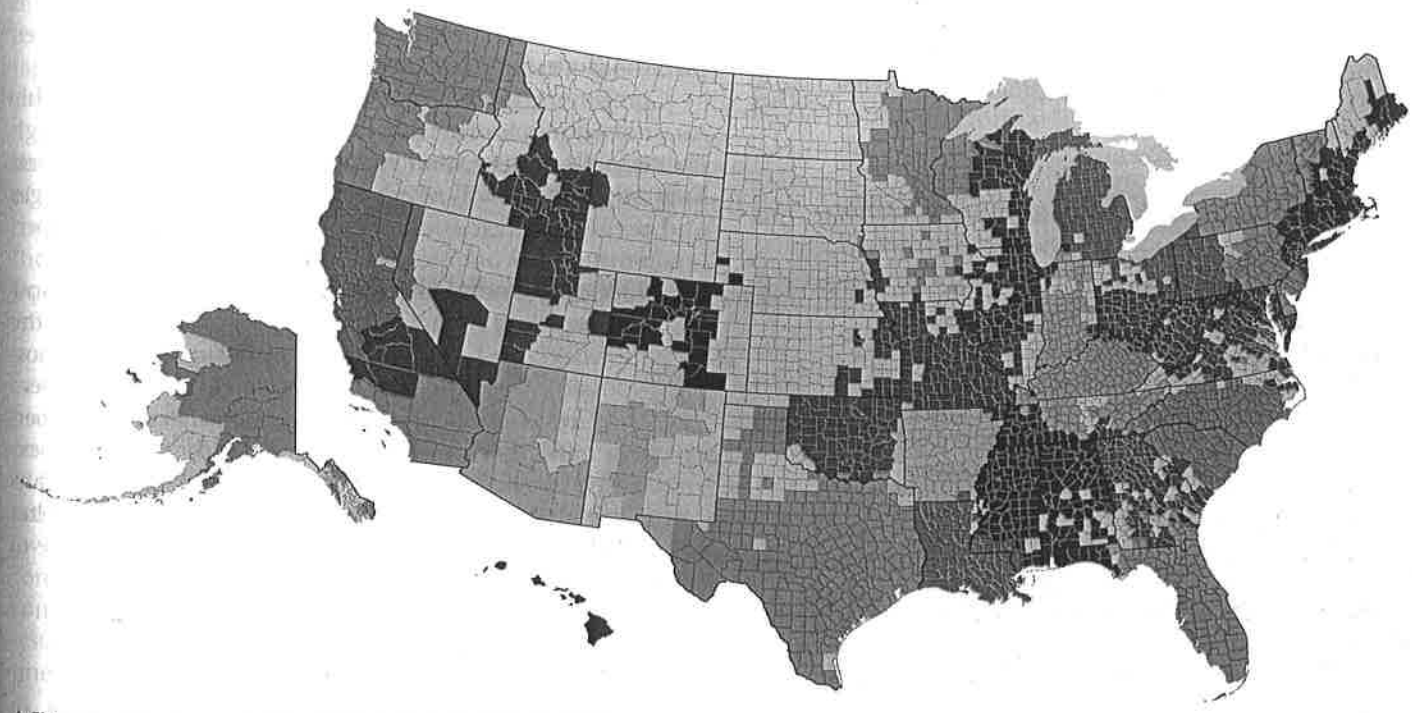
- **Hierarchical diffusion** is the spread of an idea from persons or nodes of authority or power to other persons or places (Figure 1-32). Hierarchical diffusion may result from the spread of ideas from political leaders, socially elite people, or other important persons to others in the community. Innovations may also originate in a particular node or core region of power, such as a large urban center, and diffuse later to isolated rural areas on the periphery. Hip-hop or rap music is an example of an innovation that originated in urban areas, though it diffused from low-income African Americans rather than from socially elite people.
- **Contagious diffusion** is the rapid, widespread diffusion of a characteristic throughout the population. As



▶ **FIGURE 1-31 RELOCATION DIFFUSION: EURO COINS**
Introduction of a common currency, the euro, in 12 European countries on January 1, 2002, gave scientists an unusual opportunity to measure relocation diffusion. The percentage of euro coins circulating in France but minted in other countries is a measure of the level of relocation diffusion into France.



▲ **FIGURE 1-32 HIERARCHICAL DIFFUSION: FORD LEADERSHIP**
Ford Motor Company's top executives are organized by world regions, according to where the company sells most of its vehicles.



▲ **FIGURE 1-33 CONTAGIOUS DIFFUSION: TEXT MESSAGING**
Cities are hearths of diffusion for many features. AT&T, with the help of Massachusetts Institute of Technology and IBM, mapped the origin and destination of all SMS messages for a month. Each region on the map shows a clustering of senders and recipients of messages. Areas in gray had too few senders or recipients to map.

the term implies, this form of diffusion is analogous to the spread of a contagious disease, such as influenza. Contagious diffusion spreads like a wave among fans in a stadium, without regard for hierarchy and without requiring permanent relocation of people. The rapid adoption throughout the United States of AIDS prevention methods and new medicines is an example of contagious diffusion. An idea placed on the World Wide Web spreads through contagious diffusion ("goes viral") because web surfers throughout the world have access to the same material simultaneously—and quickly (Figure 1-33).

- **Stimulus diffusion** is the spread of an underlying principle even though a characteristic itself apparently fails to diffuse. For example, innovative features of Apple's iPhone and iPad have been adopted by competitors.

Expansion diffusion occurs much more rapidly in the contemporary world than it did in the past. Hierarchical diffusion is encouraged by modern methods of communication, such as computers, texting, blogging, Twittering, and e-mail. Contagious diffusion is encouraged by use of the Internet, especially the World Wide Web. Stimulus diffusion is encouraged by all of the new technologies.

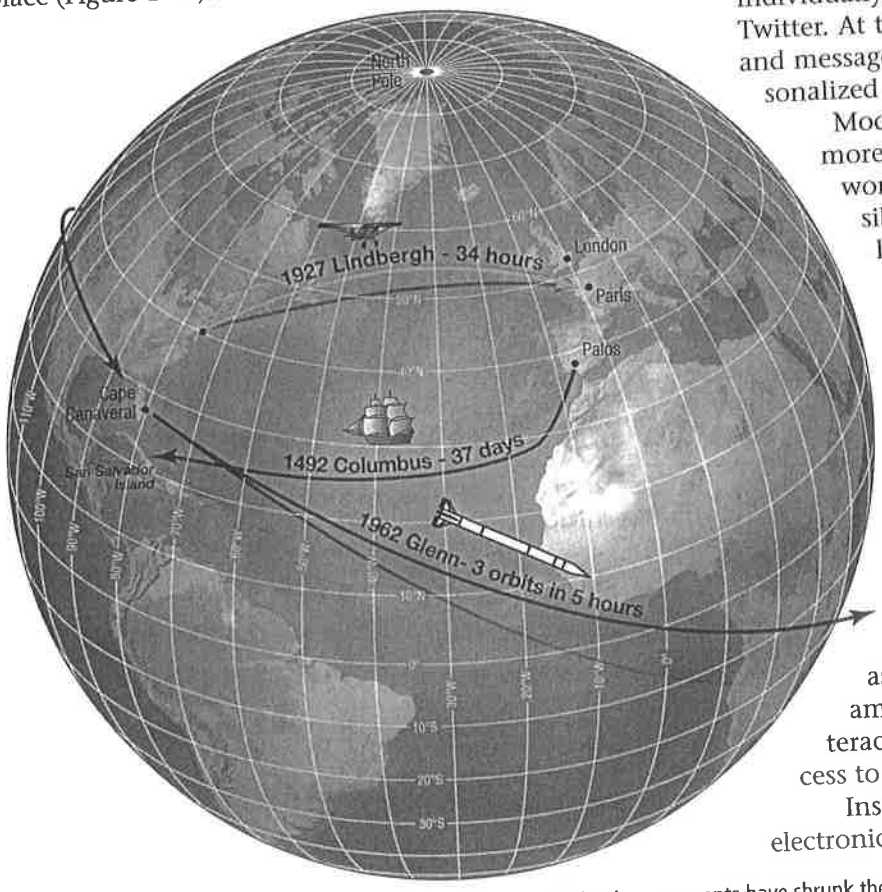
SPATIAL INTERACTION

Learning Outcome 1.3.5

Explain how places are connected through networks and how inequality can hinder connections.

In the past, most connections among cultural groups required the physical movement of settlers, explorers, and plunderers from one location to another. As recently as A.D. 1800, people traveled in the same ways and at about the same speeds as in 1800 B.C.—they were carried by an animal, took a sailboat, or walked.

The farther away someone is from another, the less likely the two are to interact. Contact diminishes with increasing distance and eventually disappears. This trailing-off phenomenon is called **distance decay.** In the contemporary world, distance decay is much less severe because connection between places takes much less time. Geographers apply the term **space–time compression** to describe the reduction in the time it takes for something to reach another place (Figure 1-34).



▲ **FIGURE 1-34 SPACE–TIME COMPRESSION** Transportation improvements have shrunk the world. In 1492, Christopher Columbus took 37 days (nearly 900 hours) to sail across the Atlantic Ocean from the Canary Islands to San Salvador Island. In 1912, the *Titanic* was scheduled to sail from Queenstown (now Cobh), Ireland, to New York in about 5 days, although two-thirds of the way across, after 80 hours at sea, it hit an iceberg and sank. In 1927, Charles Lindbergh was the first person to fly nonstop across the Atlantic, taking 33.5 hours to go from New York to Paris. In 1962, John Glenn, the first American to orbit in space, crossed above the Atlantic in about a half-hour and circled the globe three times in 5 hours.

Interaction takes place through a **network,** which is a chain of communication that connects places. Some airlines, for example, have networks known as "hub-and-spokes". With a hub-and-spokes network, an airline flies planes from a large number of places into one hub airport within a short period of time and then a short time later sends the planes to another set of places. In principle, travelers originating in relatively small towns can reach a wide variety of destinations by changing planes at the hub airport.

To be connected with another place in the modern world, we do not need to travel at all. Ideas that originate in a hearth are now able to diffuse rapidly to other areas through communications networks. One example is the TV network (for example, BBC in the United Kingdom, CBC in Canada, NBC in the United States), which comprises a chain of stations simultaneously broadcasting to distant places the same program, such as a football game. Through a communications network, diffusion from one place to another is instantaneous in time, even if the physical distance between places—as measured in kilometers or miles—is large.

Computers, tablets, and smart phones make it possible for individuals to set up their own connections through individually constructed networks such as Facebook and Twitter. At the touch of a button, we can transmit images and messages from one part of the world to our own personalized network around the world.

Modern networks make it possible for us to know more about what is happening elsewhere in the world, and space–time compression makes it possible for us to know it sooner. Distant places seem less remote and more accessible to us. With better connections between places, we are exposed to a constant barrage of cultural traits and economic initiatives from people in other regions, and perhaps we may adopt some of these cultural and economic elements.

UNEQUAL ACCESS

Electronic communications have played an especially important role in removing barriers to interaction between people who are physically far from each other. Physical barriers, such as oceans and deserts, can still retard interaction among people. In the modern world, barriers to interaction are more likely to derive from unequal access to electronics.

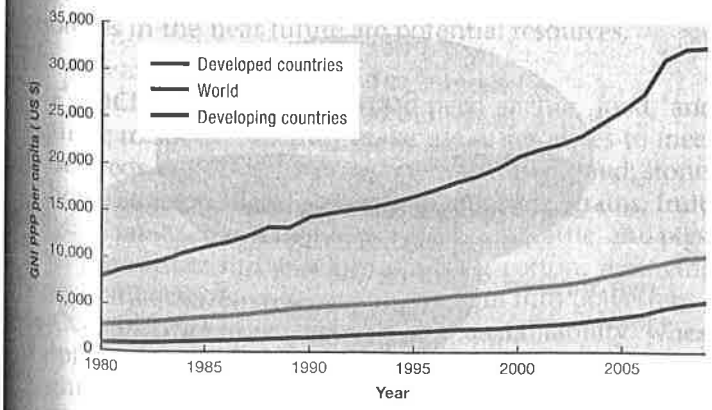
Instantaneous expansion diffusion, made possible by electronic communications, was once viewed as the "death" of geography because the ease of communications between distant places removed barriers to interaction. In reality, because of unequal access, geography matters even more than before.

People have unequal access to interaction in part because the quality of electronic service varies among places. Internet access depends on availability of electricity to power the

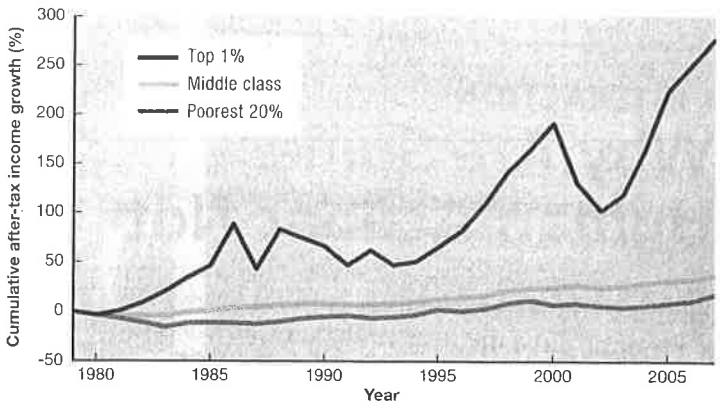
computer and a service provider. Seconds count. Broadband service requires proximity to a digital subscriber line (DSL), a cable line, or other services. Most importantly, a person must be able to afford to pay for the communications equipment and service.

Global culture and economy are increasingly centered on the three core, or hearth, regions of North America, Europe, and Japan. These three regions have a large percentage of the world's advanced technology, capital to invest in new activities, and wealth to purchase goods and services. From "command centers" in the three major world cities of New York, London, and Tokyo, key decision makers employ modern telecommunications to send orders to factories, shops, and research centers around the world—an example of hierarchical diffusion. Meanwhile, "nonessential" employees of the companies can be relocated to lower-cost offices outside the major financial centers. For example, Fila maintains headquarters in Italy but has moved 90 percent of its production of sportswear to Asian countries. Mitsubishi's corporate offices are in Japan, but its electronics products are made in other Asian countries.

Countries in Africa, Asia, and Latin America contain three-fourths of the world's population and nearly all of its population growth. However, these countries find themselves on a periphery, or outer edge, with respect to the wealthier core regions of North America, Europe, and Japan. Global investment arrives from the core through hierarchical diffusion of decisions made by transnational corporations. People in peripheral regions, who once toiled in isolated farm fields to produce food for their families, now produce crops for sale in core regions or have given up farm life altogether and migrated to cities in search of jobs in factories and offices. As a result, the global economy has produced greater disparities than in the past between the levels of wealth and well-being enjoyed by people in the core and in the periphery. The increasing gap in economic conditions between regions in the core and periphery that results from the globalization of the economy is known as **uneven development** (Figure 1-35).



▲ FIGURE 1-35 INCOME GAP BETWEEN RICH AND POOR COUNTRIES Income has increased much more rapidly in developed countries than in developing ones.



▲ FIGURE 1-36 INCOME GROWTH OF THE WEALTHIEST 1 PERCENT Between 1979 and 2007, the income of the wealthiest 1 percent in the United States grew by 278 percent, compared to an increase of approximately 34 percent for everyone else.

Economic inequality has also increased within countries. In the United States, the share of the national income held by the wealthiest 1 percent increased from 7 percent to 17 percent between 1979 and 2007, according to the Congressional Budget Office. The income of the wealthiest 1 percent increased by 278 percent, whereas the income of the poorest 20 percent increased by 18 percent, and the income of those in the middle increased by 38 percent (Figure 1-36).

In a global culture and economy, every area of the world plays some role intertwined with the roles played by other regions. Workers and cultural groups that in the past were largely unaffected by events elsewhere in the world now share a single economic and cultural world with other workers and cultural groups. The fate of an autoworker in Detroit is tied to investment decisions made in Mexico City, Seoul, Stuttgart, and Tokyo.

Pause and Reflect 1.3.5

What are the main differences between countries in the core regions and those in the periphery?

CHECK-IN: KEY ISSUE 3

Why Are Different Places Similar?

- ✓ **Geographers examine at all scales, though they are increasingly concerned with the global scale.**
- ✓ **Distribution has three properties—density, concentration, and pattern—and different cultural groups display different distributions in space.**
- ✓ **Places are connected through networks, and phenomena spread through relocation and expansion diffusion.**
- ✓ **In spite of space–time compression, peripheral regions in the global economy often have unequal access to the goods and services available in core regions.**

KEY ISSUE 4

Why Are Some Human Actions Not Sustainable?

- **Sustainability and Resources**
- **Sustainability and Human–Environment Relationships**

Learning Outcome 1.4.1
Describe the three pillars of sustainability.

Geography is distinctive because it encompasses both social science (human geography) and natural science (physical geography). This book focuses on human geography but doesn't forget that humans are interrelated with Earth's atmosphere, land, water, and vegetation, as well as with its other living creatures.

From the perspective of human geography, nature offers a large menu of resources available for people to use. A **resource** is a substance in the environment that is useful to people, economically and technologically feasible to access, and socially acceptable to use. A substance is merely part of nature until a society has a use for it. Food, water, minerals, soil, plants, and animals are examples of resources.

Sustainability and Resources

Earth's resources are divided between those that are renewable and those that are not:

- A **renewable resource** is produced in nature more rapidly than it is consumed by humans.
- A **nonrenewable resource** is produced in nature more slowly than it is consumed by humans.

Geographers observe two major misuses of resources:

- Humans deplete nonrenewable resources, such as petroleum, natural gas, and coal.
- Humans destroy otherwise renewable resources through pollution of air, water, and soil.

The use of Earth's renewable and nonrenewable natural resources in ways that ensure resource availability in the future is **sustainability**. Efforts to recycle metals, paper, and plastic, develop less polluting industrial processes, and protect farmland from suburban sprawl are all examples of practices that contribute to a more sustainable future.

THREE PILLARS OF SUSTAINABILITY

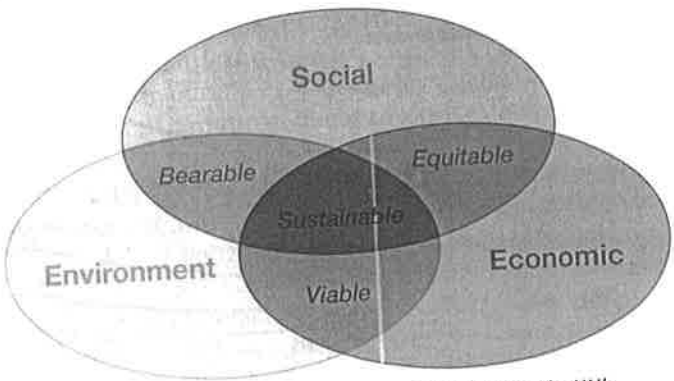
According to the United Nations, sustainability rests on three pillars: environment, economy, and society. The UN report *Our Common Future* is a landmark work in recognizing sustainability as a combination of natural and human elements. The report, released in 1987, is frequently called the Brundtland Report, named for the chair of the World Commission on Environment and Development, Gro Harlem Brundtland, former prime minister of Norway.

Sustainability requires curtailing the use of nonrenewable resources and limiting the use of renewable resources to the level at which the environment can continue to supply them indefinitely. To be sustainable, the amount of timber cut down in a forest, for example, or the number of fish removed from a body of water must remain at a level that does not reduce future supplies.

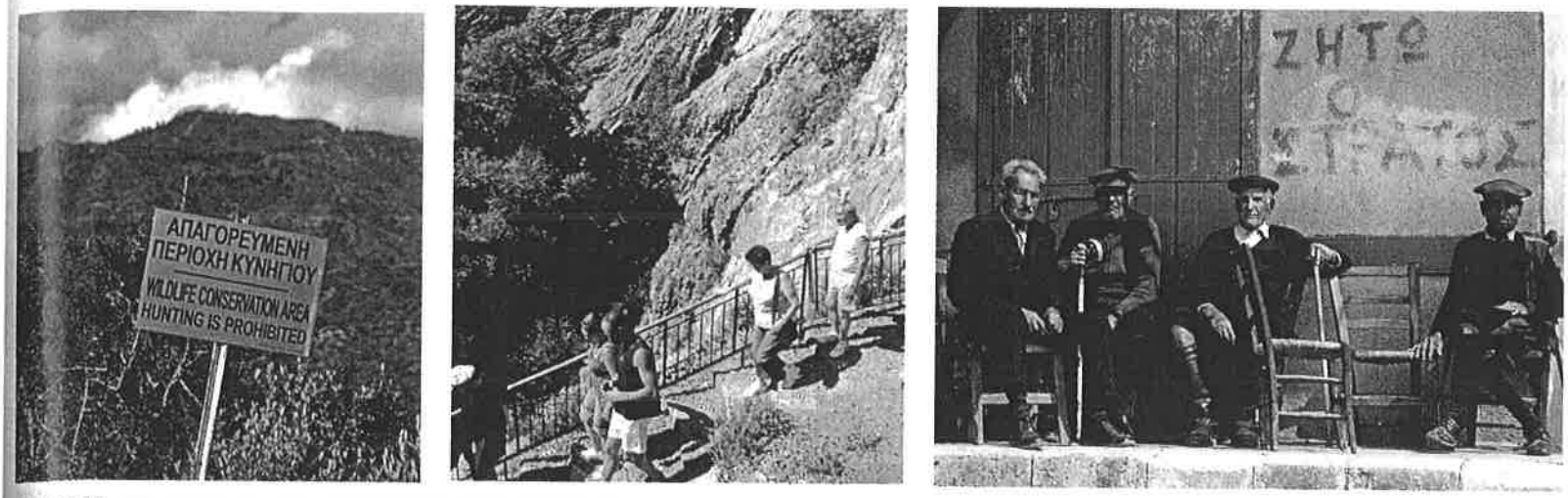
The Brundtland Report argues that sustainability can be achieved only by bringing together environmental protection, economic growth, and social equity (Figure 1-37). The report is optimistic about the possibility of promoting environmental protection at the same time as economic growth and social equity.

THE ENVIRONMENT PILLAR. The sustainable use and management of Earth's natural resources to meet human needs such as food, medicine, and recreation is **conservation.** Renewable resources such as trees and wildlife are conserved if they are consumed at a less rapid rate than they can be replaced. Nonrenewable resources such as petroleum and coal are conserved if we use less today in order to maintain more for future generations (Figure 1-38, left).

Conservation differs from **preservation**, which is the maintenance of resources in their present condition, with as little human impact as possible. Preservation takes the view that the value of nature does not derive from human needs and interests but from the fact that every plant and animal living on Earth has a right to exist and should be preserved, regardless of the cost. Preservation does not regard nature as a resource for human use. In contrast, conservation is compatible with development but only



▲ FIGURE 1-37 **THREE PILLARS OF SUSTAINABILITY** The UN's Brundtland Report considers sustainability to be a combination of environmental protection, economic development, and social equity.



▲ **FIGURE 1-38 THREE PILLARS OF SUSTAINABILITY IN THE TROODOS MOUNTAINS OF CYPRUS**
Conservation of wildlife in the Troodos Mountains, Cyprus. (left) The environment pillar. The area is known for its outstanding rock formations. Much of the area is protected as national forests and UN World Heritage sites. (center) The economy pillar: Tourism is a major economic activity. (right) The social equity pillar. Local residents watch the tourists pass by. Some of the money generated by relatively wealthy tourists helps make life more bearable for residents living in a rugged environment.

if natural resources are utilized in a careful rather than a wasteful manner.

THE ECONOMY PILLAR. Natural resources acquire a monetary value through exchange in a marketplace (Figure 1-38 (center)). In a market economy, supply and demand are the principal factors determining affordability. The greater the supply, the lower the price; the greater the demand, the higher the price. Consumers will pay more for a commodity if they strongly desire it than if they have only a moderate desire. However, geographers observe that some goods do not reflect their actual environmental costs. For example, motorists sitting in a traffic jam do not have to pay a fee for the relatively high level of pollution their vehicles are emitting into the atmosphere.

The price of a resource depends on a society's technological ability to obtain it and to adapt it to that society's purposes. Earth has many substances that we do not use today because we lack the means to extract them or the knowledge of how to use them. Things that might become resources in the near future are potential resources.

THE SOCIETY PILLAR. Humans need shelter, food, and clothing to survive, so they make use of resources to meet these needs. Homes can be built of grass, wood, mud, stone, or brick. Food can be consumed by harvesting grains, fruit, and vegetables or by eating the flesh of fish, cattle, and pigs. Clothing can be made from harvesting cotton, removing skins from animals, or turning petroleum into polyester.

Consumer choices can support sustainability when people embrace it as a value. For example, a consumer might prefer clothing made of natural or recycled materials to clothing made directly from petroleum products. Society's values are the basis for choosing which resources to use (Figure 1-38 (right)).

SUSTAINABILITY'S CRITICS

Some environmentally oriented critics have argued that it is too late to discuss sustainability. The World Wildlife Fund (WWF), for example, claims that the world surpassed its sustainable level around 1980. The WWF Living Planet Report reaches its pessimistic conclusion by comparing the amount of land that humans are currently using with the amount of "biologically productive" land on Earth. "Biologically productive land" is defined as the amount of land required to produce the resources currently consumed and handle the wastes currently generated by the world's 7 billion people at current levels of technology.

The WWF calculates that humans are currently using about 13 billion hectares of Earth's land area, including 3 billion hectares for cropland, 2 billion for forest, 7 billion for energy, and 1 billion for fishing, grazing, and built-up areas. However, according to the WWF, Earth has only 11.4 billion hectares of biologically productive land, so humans are already using all of the productive land and none is left for future growth.

Others criticize sustainability from the opposite perspective: Human activities have not exceeded Earth's capacity, they argue, because resource availability has no maximum, and Earth's resources have no absolute limit because the definition of resources changes drastically and unpredictably over time. Environmental improvements can be achieved through careful assessment of the outer limits of Earth's capacity.

Critics and defenders of sustainable development agree that one important recommendation of the UN report has not been implemented—increased international cooperation to reduce the gap between more developed and less developed countries. Only if resources are distributed in a more equitable manner can poorer countries reduce the gap with richer countries.

EARTH'S PHYSICAL SYSTEMS

Learning Outcome 1.4.2
Describe the three abiotic physical systems.

Geographers classify natural resources as part of four interrelated systems. These four physical systems are classified as either biotic or abiotic. A **biotic** system is composed of living organisms. An **abiotic** system is composed of nonliving or inorganic matter. Three of Earth's four systems are abiotic:

- The **atmosphere:** a thin layer of gases surrounding Earth.
- The **hydrosphere:** all of the water on and near Earth's surface.
- The **lithosphere:** Earth's crust and a portion of upper mantle directly below the crust.

One of the four systems is biotic:

- The **biosphere:** all living organisms on Earth, including plants and animals, as well as microorganisms.

The names of the four spheres are derived from the Greek words for "stone" (*litho*), "air" (*atmo*), "water" (*hydro*), and "life" (*bio*).

ATMOSPHERE. A thin layer of gases surrounds Earth at an altitude up to 480 kilometers (300 miles). Pure dry air in the lower atmosphere contains approximately 78 percent nitrogen, 21 percent oxygen, 0.9 percent argon, 0.036 percent carbon dioxide, and 0.064 percent other gases (measured by volume). As atmospheric gases are held to Earth by gravity, pressure is created. Variations in air pressure from one location to another are responsible for producing such weather features as wind blowing, storms brewing, and rain falling.

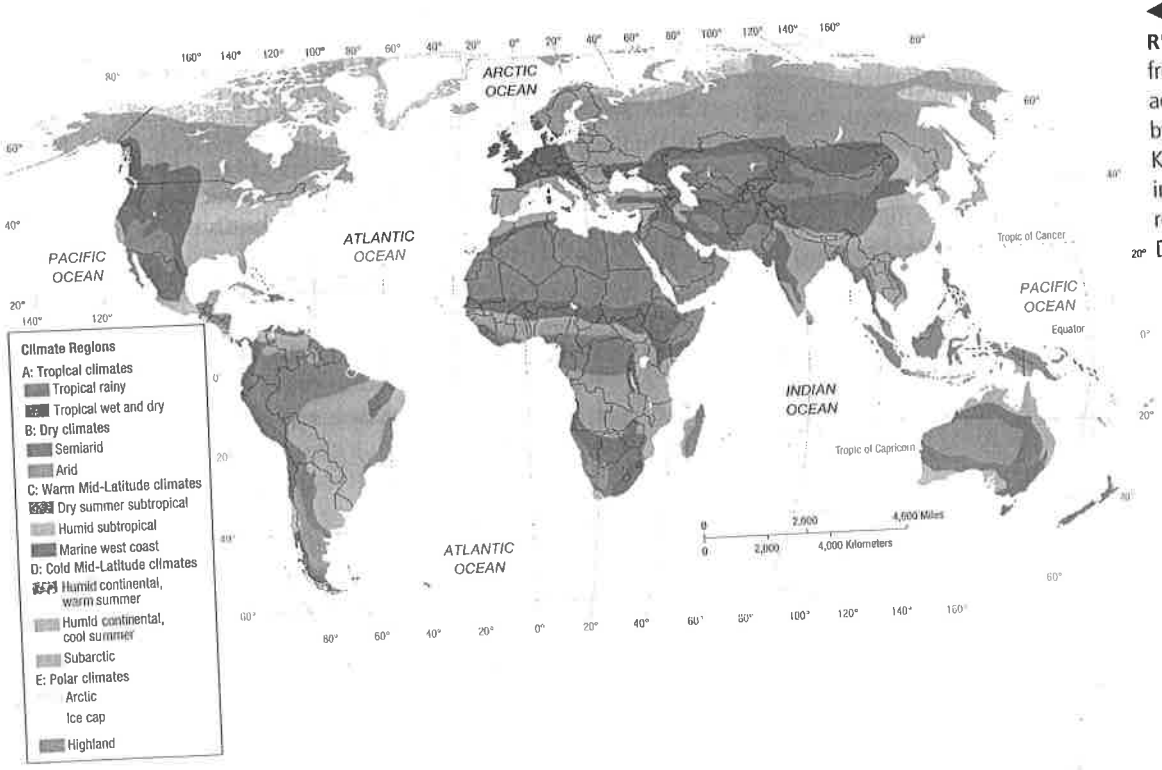
The long-term average weather condition at a particular location is **climate.** Geographers frequently classify climates according to a system developed by German climatologist Vladimir Köppen. The modified Köppen system divides the world into five main climate regions that are identified by the letters A through E, as well as by names:

- A: Tropical Climates
- B: Dry Climates
- C: Warm Mid-Latitude Climates
- D: Cold Mid-Latitude Climates
- E: Polar Climates

The modified Köppen system divides the five main climate regions into several subtypes (Figure 1-39). For all but the B climate, the basis for the subdivision is the amount of precipitation and the season in which it falls. For the B climate, subdivision is made on the basis of temperature and precipitation.

Humans have a limited tolerance for extreme temperature and precipitation levels and thus avoid living in places that are too hot, too cold, too wet, or too dry. Compare the map of global climate to the distribution of population (see Figure 2-3). Relatively few people live in the Dry (B) and Polar (E) climate regions.

HYDROSPHERE. Water exists in liquid form in the oceans, lakes, and rivers, as well as groundwater in soil and rock. It can also exist as water vapor in the atmosphere, and as ice in glaciers. Over 97 percent of the world's water is in the oceans. The oceans supply the atmosphere with water vapor, which returns to Earth's surface as precipitation, the most



◀ **FIGURE 1-39 CLIMATE REGIONS** Geographers frequently classify global climates according to a system developed by Vladimir Köppen. The modified Köppen system divides the world into five main climate regions, represented by the letters A, B, C, D, and E.

▲ **FIGURE 1-40 MONSOON IN INDIA** People are working in a rice field during the rainy season.

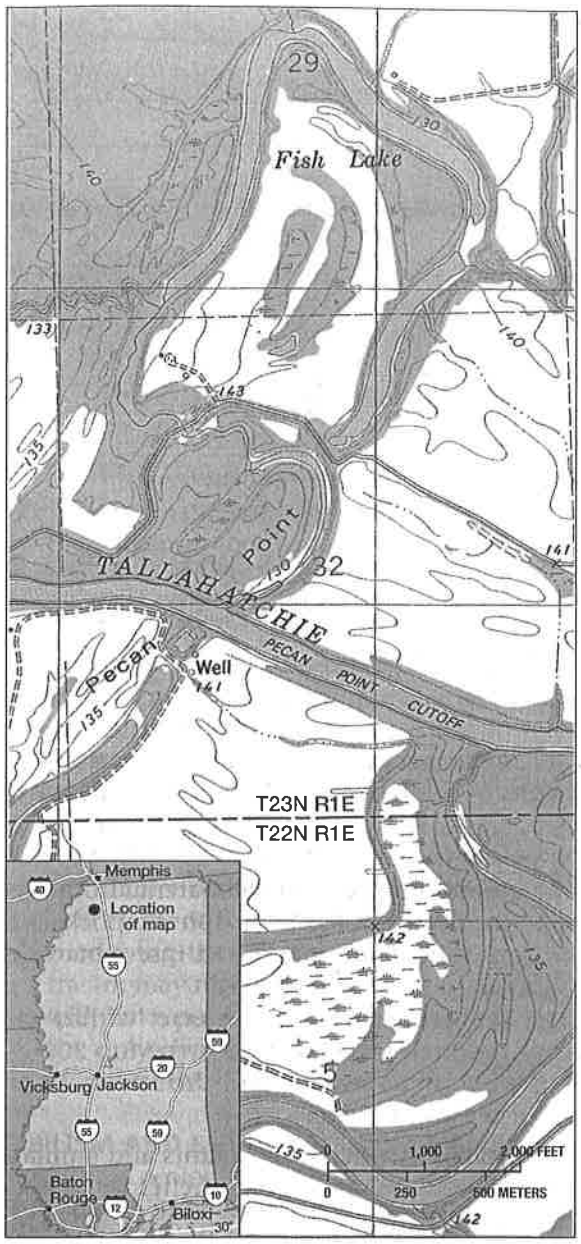
important source of freshwater. Consumption of water is essential for the survival of plants and animals, and a large quantity and variety of plants and animals live in it. Because water gains and loses heat relatively slowly, it also moderates seasonal temperature extremes over much of Earth's surface.

The climate of a particular location influences human activities, especially production of the food needed to survive. People in parts of the A climate region, especially southwestern India, Bangladesh, and the Myanmar (Burma) coast, anxiously await the annual monsoon rain, which is essential for successful agriculture and provides nearly 90 percent of India's water supply (Figure 1-40). For most of the year, the region receives dry, somewhat cool air from the northeast. In June, the wind direction suddenly shifts, bringing moist, warm, southwesterly air, known as the *monsoon*, from the Indian Ocean. The monsoon rain lasts until September. In years when the monsoon rain is delayed or fails to arrive—in recent decades, at least one-fourth of the time—agricultural output falls and famine threatens in the countries of South Asia, where nearly 20 percent of the world's people live. The monsoon rain is so important in India that the words for "year," "rain," and "rainy season" are identical in many local languages.

LITHOSPHERE. Earth is composed of concentric spheres. The core is a dense, metallic sphere about 3,500 kilometers (2,200 miles) in radius. Surrounding the core is a mantle about 2,900 kilometers (1,800 miles) thick. The crust is a thin, brittle outer shell 8 to 40 kilometers (5 to 25 miles) thick. The lithosphere encompasses the crust, a portion of the mantle extending down to about 70 kilometers (45 miles). Powerful forces deep within Earth bend and break the crust to form mountain chains and shape the crust to form continents and ocean basins.

Earth's surface features, or landforms, vary from relatively flat to mountainous. Geographers find that the study of Earth's landforms—a science known as geomorphology—helps to explain the distribution of people and the choice of economic activities at different locations. People prefer living on flatter land, which generally is better suited for agriculture. Great concentrations of people and activities in hilly areas may require extensive effort to modify the landscape.

Topographic maps, published for the United States by the U.S. Geological Survey (USGS), show details of physical



▲ **FIGURE 1-41 TOPOGRAPHIC MAP** A portion of a topographic map published by the U.S. Geological Survey shows physical features in northwestern Mississippi. The brown lines are contour lines that show the elevation of any location. The portion of the topo map shown here is part of sections 29 and 32 on the township and range map (Figure 1-30).

features, such as bodies of water, forests, mountains, valleys, and wetlands. They also show cultural features, such as buildings, roads, parks, farms, and dams. "Topos" are used by engineers, hikers, hunters, people seeking home sites, and anyone who really wants to see the lay of the land (Figure 1-41). The brown lines on the map are contour lines that show the elevation of any location. Lines are further apart in flatter areas and closer together in hilly areas.

Pause and Reflect 1.4.2

Why would maps of Earth's hydrosphere, lithosphere, and biosphere be important in the quest for sustainability?

Sustainability and Human–Environment Relationships

Learning Outcome 1.4.3
Explain how the biosphere interacts with Earth's abiotic systems.

Modern technology has altered the historic relationship between people and the environment. People are now the most important agents of change on Earth, and they can modify the environment to a greater extent than in the past. Geographers are concerned that people sometimes use modern technology to modify the environment insensitively. Human actions can deplete scarce environmental resources, destroy irreplaceable resources, and use resources inefficiently.

INTERACTIONS IN THE BIOSPHERE

The fourth natural resource system, the biosphere, encompasses all of Earth's living organisms. Because living organisms cannot exist except through interaction with the surrounding physical environment, the biosphere also includes portions of the three abiotic systems near Earth's surface. Living organisms in the biosphere interact with each of the three abiotic systems. For example, a piece of soil may comprise mineral material from the lithosphere, moisture from the hydrosphere, pockets of air from the atmosphere, and plant and insect matter from the biosphere.

Most of the living organisms interact within the top 3 meters (10 feet) of the lithosphere, the top 200 meters (650 feet) of the hydrosphere, and the lowest 30 meters (100 feet) of the atmosphere:

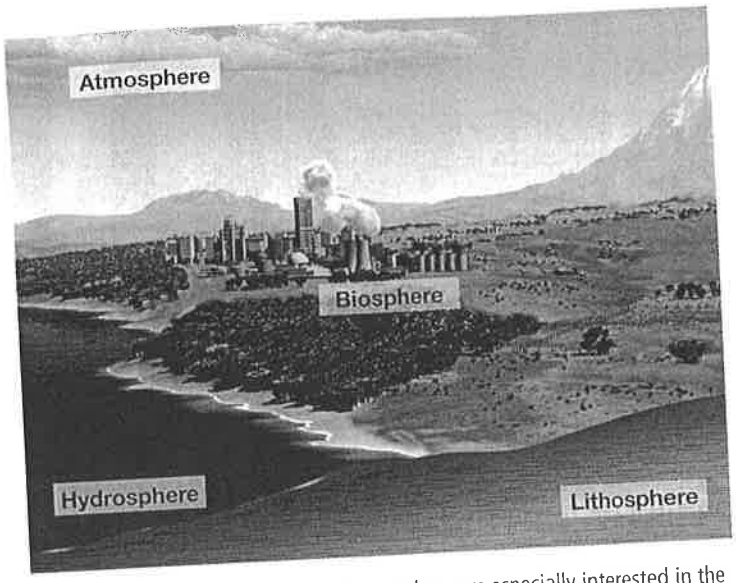
- The lithosphere is where most plants and animals live and where they obtain food and shelter.
- The hydrosphere provides water to drink and physical support for aquatic life.
- The atmosphere provides the air for animals to breathe and protects them from the Sun's rays.

A group of living organisms and the abiotic spheres with which they interact is an **ecosystem** (Figure 1-42). The scientific study of ecosystems is **ecology**. Ecologists study interrelationships between living organisms and the three abiotic environments, as well as interrelationships among the various living organisms in the biosphere.

Human geographers are especially interested in ecosystems involving the interaction of humans with the rest of the biosphere and the three abiotic spheres (Figure 1-43): If the atmosphere contains pollutants, or its oxygen level is reduced, humans have trouble breathing. Without water, humans waste away and die. A stable lithosphere provides humans with materials for buildings and fuel for energy. The rest of the biosphere provides humans with food.

For example, human actions contribute to the destruction of soil, the material that forms on Earth's surface at the thin interface between the air and the rocks. Two basic problems contribute to the destruction of soil:

- **Erosion.** Erosion occurs when the soil washes away in the rain or blows away in the wind. Farmers contribute to erosion through inappropriate choices. To reduce erosion, farmers can avoid steep slopes, plow less, and plant crops whose roots help bind the soil.
- **Depletion of nutrients.** Soil contains the nutrients necessary for successful growth of plants, including those useful to humans. Nutrients are depleted when plants withdraw more nutrients than natural processes can replace. Each type of plant withdraws certain nutrients from the soil and restores others. To minimize depletion, farmers can plant different crops from one year to the next so that the land remains productive over the long term.

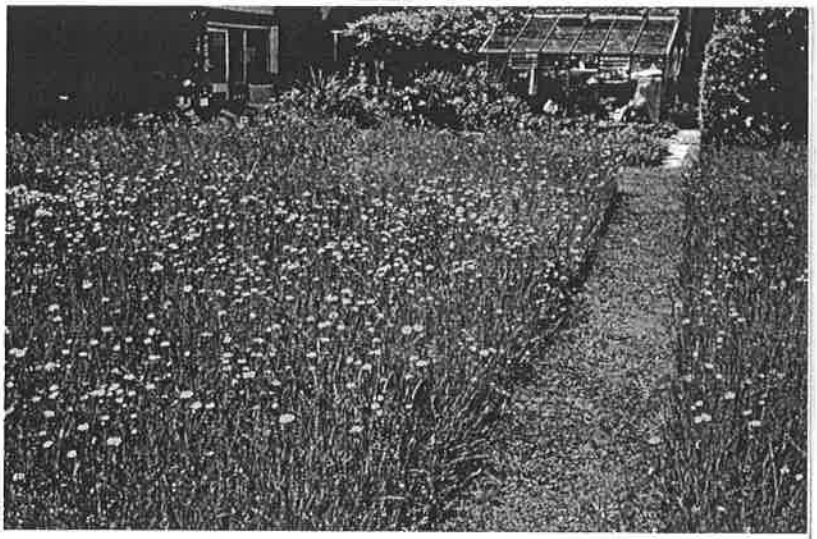


▲ **FIGURE 1-42 ECOSYSTEMS** Geographers are especially interested in the ecosystem of a city, because approximately half of Earth's humans live in urban areas. The lithosphere provides the ground and the materials to erect homes and businesses. The hydrosphere provides the water for urban dwellers to consume. The atmosphere is where urban dwellers emit pollutants. Some plants and other animals of the biosphere thrive along with humans in the cities, whereas others struggle.

CULTURAL ECOLOGY: INTEGRATING CULTURE AND ENVIRONMENT

Human geographers are especially interested in the fact that different cultural groups modify the natural environment in distinctive ways. The geographic study of human–environment relationships is known as **cultural ecology**. The roots of cultural ecology reach back more than 200 years, to an era when early scientists traveled the globe, observing how people lived in different environments.

ENVIRONMENTAL DETERMINISM. Pioneering nineteenth-century German geographers Alexander von Humboldt (1769–1859) and Carl Ritter (1779–1859) believed that the physical environment *caused* social development, an approach called **environmental determinism**.



▲ FIGURE 1-43 POSSIBILISM: ALTERNATIVE BEHAVIORS (left) Some humans prefer to mow their lawn. (right) Others prefer to let wildflowers grow.

According to Humboldt and Ritter, human geographers should apply laws from the natural sciences to understanding relationships between the physical environment and human actions. They argued that the scientific study of social and natural processes is fundamentally the same. Natural scientists have made more progress in formulating general laws than have social scientists, so an important goal of human geographers is to discover general laws. Humboldt and Ritter urged human geographers to adopt the methods of scientific inquiry used by natural scientists.

Other influential geographers adopted environmental determinism in the late nineteenth and early twentieth centuries. Friedrich Ratzel (1844–1904) and his American student Ellen Churchill Semple (1863–1932) claimed that geography was the study of the influences of the natural environment on people.

Another early American geographer, Ellsworth Huntington (1876–1947), argued that climate was a major determinant of civilization. For instance, according to Huntington, the temperate climate of maritime northwestern Europe produced greater human efficiency as measured by better health conditions, lower death rates, and higher standards of living.

POSSIBILISM. To explain relationships between human activities and the physical environment, modern geographers reject environmental determinism in favor of possibilism. According to **possibilism,** the physical environment may limit some human actions, but people have the ability to adjust to their environment. People can choose a course of action from many alternatives in the physical environment.

For example, the climate of any location influences human activities, especially food production. From one generation to the next, people learn that different crops thrive in different climates—rice requires plentiful water, whereas wheat survives on limited moisture and actually grows poorly in very wet environments. On the other hand, wheat is more likely than rice to be grown successfully in colder climates. Thus, under possibilism, people can choose the crops they grow and yet be compatible with their environment.

Some human impacts on the environment are based on deep-seated cultural values. Why do we plant our front yard with grass, water it to make it grow, mow it to keep it from growing tall, and impose fines on those who fail to mow often enough? Why not let dandelions or wildflowers grow instead (Figure 1-43)? Why does one group of people consume the fruit from deciduous trees and chop down the conifers for building materials, whereas another group chops down the deciduous trees for furniture while preserving the conifers as religious symbols? Are some of these actions more sustainable than others?

A people's level of wealth can also influence its attitude toward modifying the environment. A farmer who possesses a tractor may regard a hilly piece of land as an obstacle to avoid, but a poor farmer with a hoe may regard hilly land as the only opportunity to produce food for survival through hand cultivation.

POSSIBILISM AND SUSTAINABILITY. Human geographers use the cultural ecology, or human–environment, approach to understand whether particular patterns and processes are sustainable. For example, world population growth is a problem if the number of people exceeds the capacity of the physical environment to produce food. However, people can adjust to the capacity of the physical environment by controlling their numbers, adopting new technology, consuming different foods, migrating to new locations, and taking other actions.

The physical environment is not always the most significant factor in human decisions. People can fashion a landscape by superimposing new forms on the physical environment. For example, the critical factor in selecting a site for a cotton textile factory is not proximity to a place where cotton is grown. A more important factor in selecting a suitable location is access to a supply of low-cost labor. Economic systems, political structures, living arrangements, religious practices, and human activities can produce distinctive landscapes that do not stem primarily from distinctive physical features. The geographer's job is to sort out the associations among various social characteristics, each of which is uniquely distributed across Earth's surface.

MODIFYING THE ENVIRONMENT

Learning Outcome 1.4.4
Compare ecosystems in the Netherlands and southern Florida.

Few ecosystems have been as thoroughly modified by humans as the Netherlands and Florida's Everglades. Because more than half of the Netherlands lies below sea level, most of the country today would be under water if it were not for massive projects to modify the environment by holding back the sea. Meanwhile, the fragile landscape of south Florida has been altered in insensitive ways.

THE NETHERLANDS: SUSTAINABLE ECOSYSTEM. The Dutch have a saying that "God made Earth, but the Dutch made the Netherlands." The Dutch have modified their environment with two distinctive types of construction projects—polders and dikes.

A **polder** is a piece of land that is created by draining water from an area. Polders, first created in the thirteenth century, were constructed primarily by private developers in the sixteenth and seventeenth centuries and by the government during the past 200 years. All together, the Netherlands has 6,500 square kilometers (2,600 square miles) of polders, comprising 16 percent of the country's land area (Figure 1-44). The Dutch government has reserved most of the polders for agriculture to reduce the country's dependence on imported food. Some of the polders are used for housing, and one contains Schiphol, one of Europe's busiest airports.

The second distinctive modification of the landscape in the Netherlands is the construction of massive dikes to prevent the North Sea, an arm of the Atlantic Ocean, from flooding much of the country. The Dutch have built dikes in two major locations—the Zuider Zee project in the north and the Delta Plan project in the southwest.

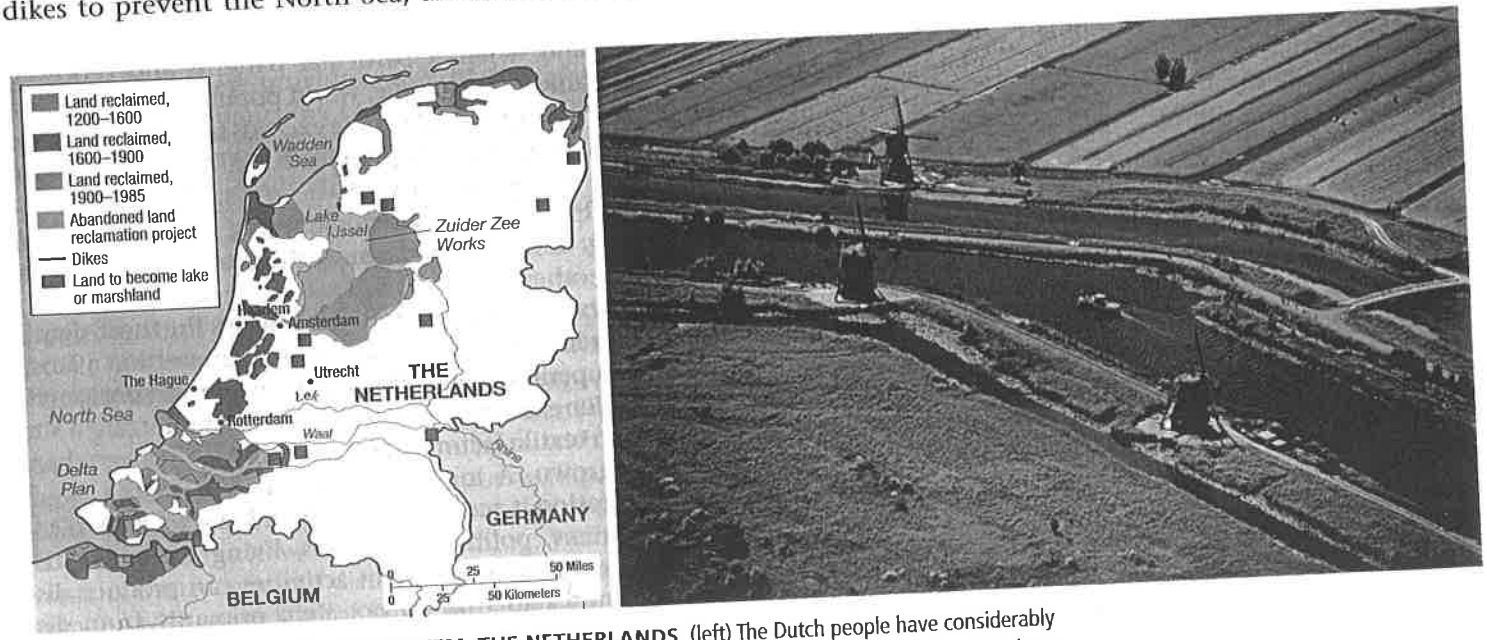
The Zuider Zee, an arm of the North Sea, once threatened the heart of the Netherlands with flooding. A dike completed in 1932 caused the Zuider Zee to be converted from a saltwater sea to a freshwater lake called Lake IJssel. Some of the lake has been drained to create several polders.

A second ambitious project in the Netherlands is the Delta Plan. Several rivers that flow through the Netherlands to the North Sea split into many branches and form a low-lying delta that is vulnerable to flooding. After a devastating flood in January 1953 killed nearly 2,000 people, the Delta Plan called for the construction of several dams to close off most of the waterways.

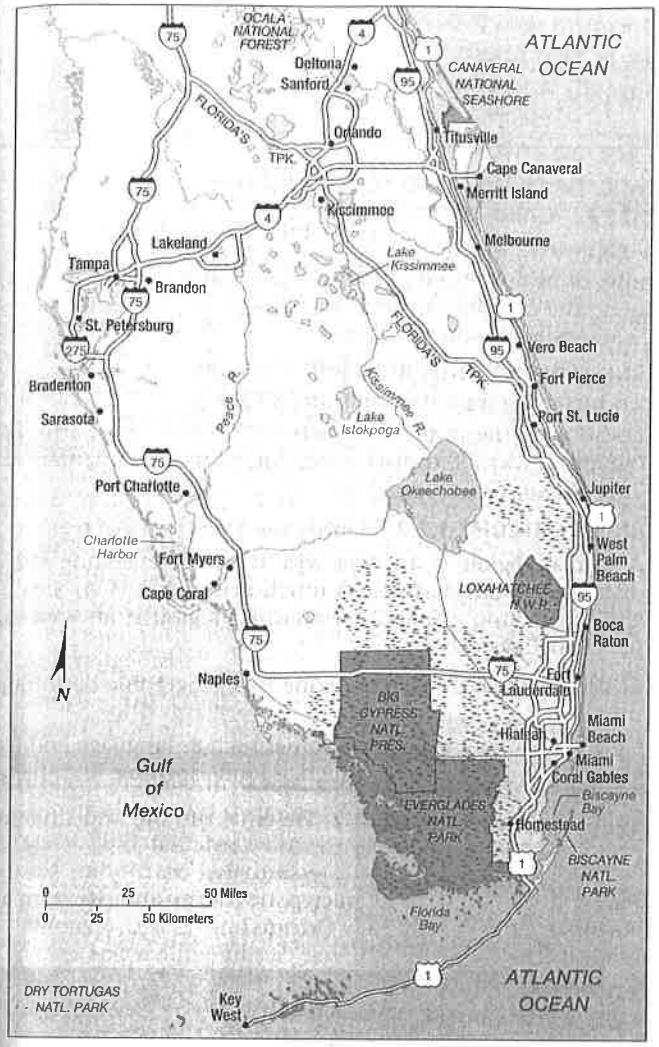
Once these two massive projects were finished, attitudes toward modifying the environment changed in the Netherlands. The Dutch scrapped plans to build additional polders in the IJsselmeer in order to preserve the lake's value for recreation.

The Dutch are deliberately breaking some of the dikes to flood fields. A plan adopted in 1990 called for returning 263,000 hectares (650,000 acres) of farms to wetlands or forests. Widespread use of insecticides and fertilizers on Dutch farms has contributed to contaminated drinking water, acid rain, and other environmental problems.

Global warming could threaten the Netherlands by raising the level of the sea around the country by between 20 and 58 centimeters (8 and 23 inches) within the next 100 years. Rather than build new dikes and polders, the Dutch have become world leaders in reducing the causes of global warming by acting to reduce industrial pollution and increase solar and wind power use, among other actions.



▲ **FIGURE 1-44 SUSTAINABLE ECOSYSTEM: THE NETHERLANDS** (left) The Dutch people have considerably altered the site of the Netherlands through creation of polders and dikes. (right) A polder in North Holland has been created by pumping the water from the site into the canal.



▲ **FIGURE 1-45 UNSUSTAINABLE ECOSYSTEM: SOUTH FLORIDA**
To control flooding in central Florida, the U.S. Army Corps of Engineers straightened the course of the Kissimmee River, which had meandered for 160 kilometers (98 miles) from near Orlando to Lake Okeechobee. The water was rechanneled into a canal 90 meters wide (300 feet) and 9 meters deep (30 feet), running in a straight line for 84 kilometers (52 miles).

SOUTH FLORIDA: UNSUSTAINABLE ECOSYSTEM. Sensitive environmental areas in South Florida include barrier islands along the Atlantic and Gulf coasts, the wetlands between Lake Okeechobee and the Everglades National Park, and the Kissimmee River between Lake Kissimmee and Lake Okeechobee (Figure 1-45). These lowlands have been modified less sensitively than those in the Netherlands.

The Everglades was once a very wide and shallow freshwater river 80 kilometers (50 miles) wide and 15 centimeters (6 inches) deep, slowly flowing south from Lake Okeechobee to the Gulf of Mexico. A sensitive ecosystem of plants and animals once thrived in this distinctive landscape, but much of it has been destroyed by human actions.

The U.S. Army Corps of Engineers built a levee around Lake Okeechobee during the 1930s, drained the northern one-third of the Everglades during the 1940s, diverted the Kissimmee River into canals during the 1950s, and constructed dikes and levees near Miami and Fort Lauderdale during the 1960s. The southern portion of the Everglades became a National Park. These modifications opened up hundreds of thousands of hectares of land for growing sugarcane and protected farmland as well as the land occupied by the growing South Florida population from flooding. But they had unintended consequences for South Florida's environment.

Polluted water, mainly from cattle grazing along the banks of the canals, flowed into Lake Okeechobee, which is the source of freshwater for half of Florida's population. Fish in the lake began to die from the high levels of mercury, phosphorous, and other contaminants. The polluted water then continued to flow south into the National Park, threatening native vegetation such as sawgrass and endangering rare birds and other animals.

A 2000 plan called for restoring the historic flow of water through South Florida while improving flood control and water quality. A 2008 plan called for the state to acquire hundreds of thousands of acres of land from sugarcane growers. But to date, few elements of the plans to restore the Everglades have been implemented. One-half of the Everglades has been lost to development. In an ironic reminder of the Dutch saying quoted earlier, Floridians say, "God made the world in six days, and the Army Corps of Engineers has been tinkering with it ever since."

A generation ago, people concerned with environmental quality proclaimed, "Think global, act local." The phrase meant that the environment was being harmed by processes such as global warming that were global in scale, but it could be improved by actions, such as consuming less gasoline, that were local in scale. Contemporary geographers offer a different version of the phrase: "Think and act both global and local." All scales from local to global are important in geography—the appropriate scale depends on the specific subject.

Pause and Reflect 1.4.4

Both the Netherlands and the Florida Everglades face threats to their sustainability. Which is better positioned to face future challenges? Explain your answer.

CHECK-IN: KEY ISSUE 4

Why Are Some Human Actions Not Sustainable?

- ✓ **Sustainability combines environment, economy, and society.**
- ✓ **The interaction of humans and other living organisms with other physical systems results in ecosystems that may or may not be sustainable.**

Summary and Review

KEY ISSUE 1

How Do Geographers Describe Where Things Are?

Geography is most fundamentally a spatial science. Geographers use maps to display the location of objects and to extract information about places. Early geographers drew maps of Earth's surface based on exploration and observation. Today contemporary tools, such as remote sensing, GPS, and GIS, assist geographers in understanding reasons for observed regularities across Earth.

LEARNING OUTCOME 1.1.1: Explain differences between early maps and contemporary maps.

- Some of the earliest maps were used for navigation. Maps have had many other uses as tools of reference and communication.

LEARNING OUTCOME 1.1.2: Describe the role of map scale and projections in making maps.

- Contemporary maps indicate scale in three ways. Four types of distortion can occur in the transfer of Earth's round surface to a flat map.

LEARNING OUTCOME 1.1.3: Explain how latitude and longitude are used to locate points on Earth's surface.

- Latitude indicates position north or south of the equator, and longitude indicates position east or west of the prime meridian.

LEARNING OUTCOME 1.1.4: Identify contemporary analytic tools, including remote sensing, GPS, and GIS.

- Geographers today use the tools of Geographic Information Science (GIScience). Data gathered by remote sensing and GPS to measure changes over time and the characteristics of places can be combined and analyzed using geographic information systems (GIS).

THINKING GEOGRAPHICALLY 1.1: Mapping is partially a science, but it also involves a lot of human judgment. Provide examples of human judgment in mapping, such as in the creation of the geographic grid and in contemporary tools.

GOOGLE EARTH 1.1: What are the precise latitude and longitude of the U.S. Capitol building?

KEY ISSUE 2

Why Is Each Point on Earth Unique?

Every place on Earth is in some respects unique. Geographers also identify unique regions as areas distinguished by distinctive combinations of cultural as well as economic and environmental features. The distribution of features helps to explain why every place and every region is unique.

LEARNING OUTCOME 1.2.1: Identify geographic characteristics of places, including toponym, site, and situation.

- Location is the position something occupies on Earth. Geographers identify a place's location using place names, site, and situation.

LEARNING OUTCOME 1.2.2: Identify the three types of regions.

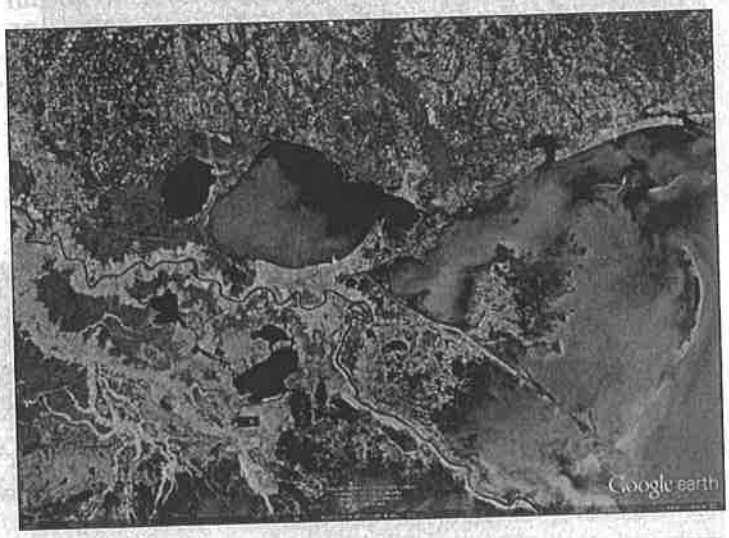
- A formal region is an area within which everyone shares distinctive characteristics. A functional region is an area organized around a node. A vernacular region is an area that people believe exists.

LEARNING OUTCOME 1.2.3: Describe two geographic definitions of culture.

- Culture can refer to cultural values such as language and religion, or to material culture such as food, clothing, and shelter.

THINKING GEOGRAPHICALLY 1.2: Describe the site and situation of your hometown.

GOOGLE EARTH 1.2: What characteristics of site and situation are visible in an aerial view of New Orleans?



Key Terms

Abiotic (p. 32) Composed of nonliving or inorganic matter.

Atmosphere (p. 32) The thin layer of gases surrounding Earth.

Biosphere (p. 32) All living organisms on Earth, including plants and animals, as well as microorganisms.

Biotic (p. 32) Composed of living organisms.

Cartography (p. 5) The science of making maps.

Climate (p. 32) The long-term average weather condition at a particular location.

Concentration (p. 22) The spread of something over a given area.

Connection (p. 26) Relationships among people and objects across the barrier of space.

Conservation (p. 30) The sustainable management of a natural resource.

Contagious diffusion (p. 26) The rapid, widespread diffusion of a feature or trend throughout a population.

Cultural ecology (p. 34) A geographic approach that emphasizes human–environment relationships.

Cultural landscape (p. 16) The fashioning of a natural landscape by a cultural group.

Culture (p. 18) The body of customary beliefs, social forms, and material traits that together constitute a group's distinct tradition.

Density (p. 22) The frequency with which something exists within a given unit of area.

KEY ISSUE 3

Why Are Different Places Similar?

Geographers work at all scales, from local to global. The global scale is increasingly important because few places in the contemporary world are totally isolated. Because places are connected to each other, they display similarities. Geographers study the interactions of groups of people and human activities across space, and they identify processes by which people and ideas diffuse from one location to another over time.

LEARNING OUTCOME 1.3.1: Give examples of changes in economy and culture occurring at global and local scales.

- Globalization means that the scale of the world is shrinking in terms of economy and culture.

LEARNING OUTCOME 1.3.2: Identify the three properties of distribution across space.

- Density is the frequency with which something occurs, concentration is the extent of spread, and pattern is the geometric arrangement.

LEARNING OUTCOME 1.3.3: Describe different ways in which geographers approach aspects of cultural identity such as gender, ethnicity, and sexuality.

- Males and females, whites and minorities, heterosexuals and homosexuals occupy different places and move across space differently.
- Critical geographers have developed different approaches to studying how different cultural groups perceive, experience, organize, and move through space.

LEARNING OUTCOME 1.3.4: Describe how characteristics can spread across space over time through diffusion.

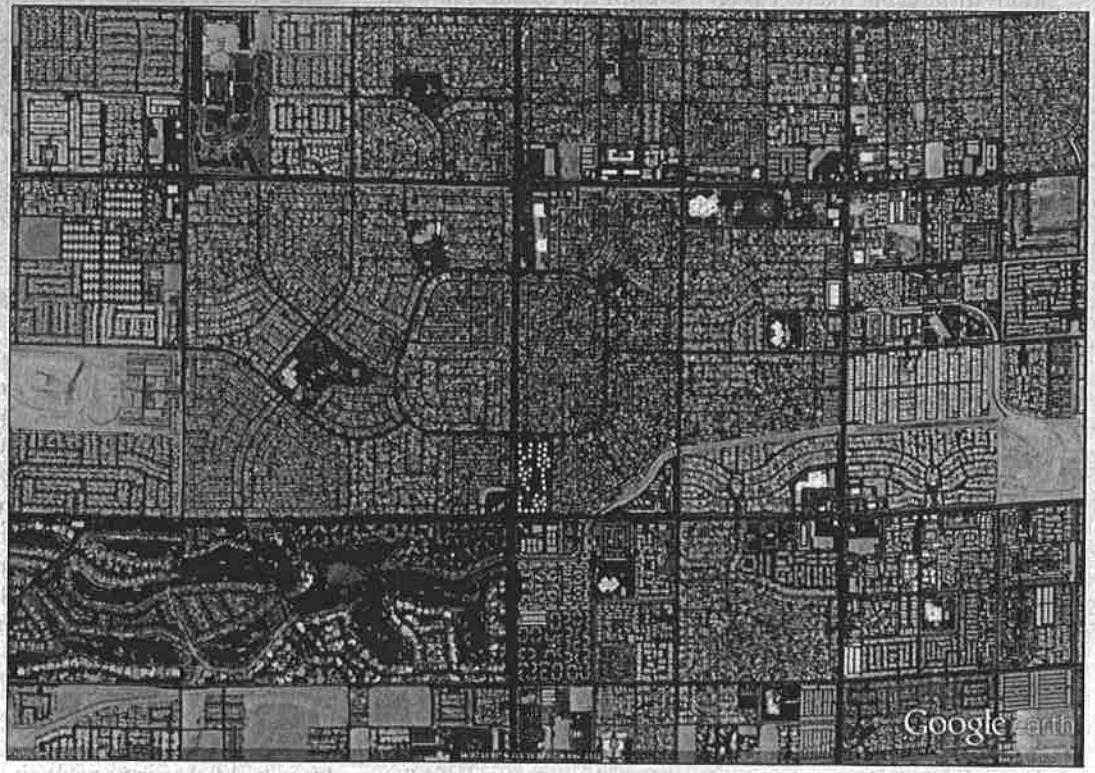
- Something originates at a hearth and diffuses through either relocation diffusion (physical movement) or expansion diffusion (additive processes).

LEARNING OUTCOME 1.3.5: Explain how places are connected through networks and how inequality can hinder connections.

- Electronic communications have removed many physical barriers to interaction for those with access to them.

THINKING GEOGRAPHY 1.3: Imagine that a transportation device (perhaps like *Harry Potter's* floo powder) would enable all humans to travel instantaneously to any location on Earth. What might be the impact on the distribution of people and activities across Earth?

GOOGLE EARTH 1.3: How have the properties of distribution of Spring Valley, Nevada, changed over time?



Diffusion (p. 26) The process of spread of a feature or trend from one place to another over time.

Distance decay (p. 28) The diminishing in importance and eventual disappearance of a phenomenon with increasing distance from its origin.

Distribution (p. 22) The arrangement of something across Earth's surface.

Ecology (p. 34) The scientific study of ecosystems.

Ecosystem (p. 34) A group of living organisms and the abiotic spheres with which they interact.

Environmental determinism (p. 34) A nineteenth- and early twentieth-century approach to the study of geography which argued that the general laws sought by human geographers could be found in the physical sciences. Geography was therefore the study of how the physical environment caused human activities.

Expansion diffusion (p. 26) The spread of a feature or trend among people from one area to another in an additive process.

Formal region (or uniform or homogeneous region) (p. 16) An area in which everyone shares in common one or more distinctive characteristics.

Functional region (or nodal region) (p. 17) An area organized around a node or focal point.

Geographic information science (GIScience) (p. 12) The development and analysis of data about Earth acquired through satellite and other electronic information technologies.

KEY ISSUE 4

Why Are Some Human Actions Not Sustainable?

LEARNING OUTCOME 1.4.1: Describe the three pillars of sustainability.

- Sustainability is the use of Earth's natural resources in ways that ensure availability in the future. This is accomplished through a combination of environmental, economic, and social action.

LEARNING OUTCOME 1.4.2: Describe the three abiotic physical systems.

- Earth comprises four physical systems: the atmosphere, hydrosphere, lithosphere, and biosphere.

LEARNING OUTCOME 1.4.3: Explain how the biosphere interacts with Earth's abiotic systems.

- An ecosystem comprises a group of living organisms in the biosphere and their interaction with the atmosphere, lithosphere, and biosphere.

LEARNING OUTCOME 1.4.4: Compare ecosystems in the Netherlands and southern Louisiana.

- The Dutch have modified the ecosystem of their land in a more sustainable manner than has been the case in southern Louisiana.

THINKING GEOGRAPHICALLY 1.4: What activities in your community appear to be promoting sustainability?

GOOGLE EARTH 1.4: How many dams do you see along the southwestern coast of the Netherlands, in the vicinity of the town of Stellendam?

Geographic information system (GIS) (p. 12) A computer system that stores, organizes, analyzes, and displays geographic data.

Global Positioning System (GPS) (p. 12) A system that determines the precise position of something on Earth through a series of satellites, tracking stations, and receivers.

Globalization (p. 20) Actions or processes that involve the entire world and result in making something worldwide in scope.

Greenwich Mean Time (GMT) (p. 11) The time in the zone encompassing the prime meridian, or 0° longitude.

Hearth (p. 26) The region from which innovative ideas originate.

Hierarchical diffusion (p. 26) The spread of a feature or trend from one key person or node of authority or power to other persons or places.

Housing bubble (p. 20) A rapid increase in the value of houses followed by a sharp decline in their value.

Hydrosphere (p. 32) All of the water on and near Earth's surface.

International Date Line (p. 11) An arc that for the most part follows 180° longitude, although it deviates in several places to avoid dividing land areas. When you cross the International Date Line heading east (toward America), the clock moves back 24 hours, or one entire day. When you go west (toward Asia), the calendar moves ahead one day.

Latitude (p. 10) The numbering system used to indicate the location of parallels drawn on a globe and measuring distance north and south of the equator (0°).

Lithosphere (p. 32) Earth's crust and a portion of upper mantle directly below the crust.

Location (p. 14) The position of anything on Earth's surface.

Longitude (p. 10) The numbering system used to indicate the location of meridians drawn on a globe and measuring distance east and west of the prime meridian (0°).

Map (p. 5) A two-dimensional, or flat, representation of Earth's surface or a portion of it.

Map scale (p. 8) The relationship between the size of an object on a map and the size of the actual feature on Earth's surface.

Mental map (p. 17) A representation of a portion of Earth's surface based on what an individual knows about a place, containing personal impressions of what is in the place and where the place is located.

Meridian (p. 10) An arc drawn on a map between the North and South poles.

Network (p. 28) A chain of communication that connects places.

Nonrenewable resource (p. 30) Something produced in nature more slowly than it is consumed by humans.

Parallel (p. 10) A circle drawn around the globe parallel to the equator and at right angles to the meridians.

Pattern (p. 23) The geometric or regular arrangement of something in a study area.

Place (p. 14) A specific point on Earth distinguished by a particular characteristic.

Polder (p. 36) Land created by the Dutch by draining water from an area.

Possibilism (p. 35) The theory that the physical environment may set limits on human actions, but people have the ability to adjust to the physical environment and choose a course of action from many alternatives.

Preservation (p. 30) The maintenance of resources in their present condition, with as little human impact as possible.

Prime meridian (p. 10) The meridian, designated as 0° longitude, that passes through the Royal Observatory at Greenwich, England.

Projection (p. 9) A system used to transfer locations from Earth's surface to a flat map.

Region (p. 16) An area distinguished by a unique combination of trends or features.

Regional (or cultural landscape) studies (p. 16) An approach to geography that emphasizes the relationships among social and physical phenomena in a particular study area.

Relocation diffusion (p. 26) The spread of a feature or trend through bodily movement of people from one place to another.

Remote sensing (p. 12) The acquisition of data about Earth's surface from a satellite orbiting the planet or from other long-distance methods.

Renewable resource (p. 30) Something produced in nature more rapidly than it is consumed by humans.

Resource (p. 30) A substance in the environment that is useful to people, is economically and technologically feasible to access, and is socially acceptable to use.

Scale (p. 20) Generally, the relationship between the portion of Earth being studied and Earth as a whole.

Site (p. 14) The physical character of a place.

Situation (p. 15) The location of a place relative to another place.

Space (p. 22) The physical gap or interval between two objects.

Space-time compression (p. 28) The reduction in the time it takes to diffuse something to a distant place as a result of improved communications and transportation systems.

Stimulus diffusion (p. 27) The spread of an underlying principle even though a specific characteristic is rejected.

Sustainability (p. 30) The use of Earth's renewable and nonrenewable natural resources in ways that do not constrain resource use in the future.

Toponym (p. 14) The name given to a portion of Earth's surface.

Transnational corporation (p. 20) A company that conducts research, operates factories, and sells products in many countries, not just where its headquarters or shareholders are located.

Uneven development (p. 29) The increasing gap in economic conditions between core and peripheral regions as a result of the globalization of the economy.

Vernacular region (or perceptual region) (p. 17) An area that people believe exists as part of their cultural identity.