

Rain Shadow Effect

Most of the moisture in the ocean air falls on the mountainside facing the wind. Little moisture remains to fall on the other side, creating a rain shadow.

Hurricanes produce drenching rain and strong winds that can reach speeds of 155 miles per hour (250 kph) or more. This is more than twice as fast as most people drive on highways. In addition, hurricanes form tall walls of water called storm surges. When a storm surge smashes into land, it can wipe out an entire coastal area.

READING CHECK Analyzing Why do coastal areas have milder climates than inland areas?

Mountains

Mountains can influence an area's climate by affecting both temperature and precipitation. Many high mountains are located in warm areas yet have snow at the top all year. How can this be? The reason is that temperature decreases with elevation—the height on Earth's surface above sea level.

Mountains also create wet and dry areas. Look at the diagram at left. A mountain forces air blowing against it to rise. As it rises, the air cools and precipitation falls as rain or snow. Thus, the side of the mountain facing the wind is often green and lush. However, little moisture remains for the other side. This effect creates a rain shadow, a dry area on the mountainside facing away from the direction of the wind.

READING CHECK Finding Main Ideas How does temperature change with elevation?

SUMMARY AND PREVIEW As you can see, the sun, location on Earth, wind, water, and mountains affect weather and climate. In the next section you will learn what the world's different climate regions are like.

Section 1 Assessment

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ONLINE QUIZ

Reviewing Ideas, Terms, and Places

- a. **Recall** What shapes **weather** and **climate**?

b. **Contrast** How do weather and climate differ?
- a. **Identify** What parts of Earth receive the most heat from the sun?

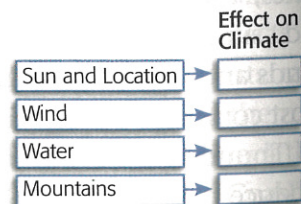
b. **Explain** Why do the poles receive less solar energy than the equator does?
- a. **Describe** What creates wind?

b. **Summarize** How do **ocean currents** and large bodies of water affect climate?
- a. **Define** What is a rain shadow?

b. **Explain** Why might a mountaintop and a nearby valley have widely different temperatures?

Critical Thinking

- Identifying Cause and Effect** Draw a chart like this one. Use your notes to explain how each factor affects climate.



FOCUS ON VIEWING

- Writing about Weather and Climate** Jot down information to include in your weather report. For example, you might want to include a term such as fronts or describe certain types of storms such as hurricanes or tornadoes.

World Climates

SECTION

2

If YOU lived there...

You live in Colorado and are on your first serious hike in the Rocky Mountains. Since it is July, it is hot in the campground in the valley. But your guide insists that you bring a heavy fleece jacket. By noon, you have climbed to 11,000 feet. You are surprised to see patches of snow in shady spots. Suddenly, you are very happy that you brought your jacket!

Why does it get colder as you climb higher?

BUILDING BACKGROUND While weather is the day-to-day changes in a certain area, climate is the average weather conditions over a long period. Earth's different climates depend partly on the amount of sunlight a region receives. Differences in climate also depend on factors such as wind, water, and elevation.

Major Climate Zones

In January, how will you dress for the weekend? In some places, you might get dressed to go skiing. In other places, you might head out in a swimsuit to go to the beach. What the seasons are like where you live depends on climate.

Earth is a patchwork of climates. Geographers identify these climates by looking at temperature, precipitation, and native plant life. Using these items, we can divide Earth into five general climate zones—tropical, temperate, polar, dry, and highland.

The first three climate zones relate to latitude. Tropical climates occur near the equator, in the low latitudes. Temperate climates occur about halfway between the equator and the poles, in the middle latitudes. Polar climates occur near the poles, in the high latitudes. The last two climate zones occur at many different latitudes. In addition, geographers divide some climate zones into more specific climate regions. The chart and map on the next two pages describe the world's climate regions.

READING CHECK **Drawing Inferences** Why do you think geographers consider native plant life when categorizing climates?

What You Will Learn...

Main Ideas

1. Geographers use temperature, precipitation, and plant life to identify climate zones.
2. Tropical climates are wet and warm, while dry climates receive little or no rain.
3. Temperate climates have the most seasonal change.
4. Polar climates are cold and dry, while highland climates change with elevation.

The Big Idea

Earth's five major climate zones are identified by temperature, precipitation, and plant life.

Key Terms

monsoons, p. 58
savannas, p. 58
steppes, p. 59
permafrost, p. 61



Use the graphic organizer online to take notes on Earth's major climate zones.

World Climate Regions

To explore the world's climate regions, start with the chart below. After reading about each climate region, locate the places on the map that have that climate. As you locate climates, look for patterns. For example, places near the equator tend to have warmer climates than places near the poles. See if you can identify some other climate patterns.



Tropical climate



Climate		Where is it?	What is it like?	Plants
Tropical	HUMID TROPICAL	On and near the equator	Warm with high amounts of rain year-round; in a few places, monsoons create extreme wet seasons	Tropical rain forest
	TROPICAL SAVANNA	Higher latitudes in the tropics	Warm all year; distinct rainy and dry seasons; at least 20 inches (50 cm) of rain during the summer	Tall grasses and scattered trees
Dry	DESERT	Mainly center on 30° latitude; also in middle of continents, on west coasts, or in rain shadows	Sunny and dry; less than 10 inches (25 cm) of rain a year; hot in the tropics; cooler with wide daytime temperature ranges in middle latitudes	A few hardy plants, such as cacti
	STEPPE	Mainly bordering deserts and interiors of large continents	About 10–20 inches (25–50 cm) of precipitation a year; hot summers and cooler winters with wide temperature ranges during the day	Shorter grasses; some trees and shrubs by water
Temperate	MEDITERRANEAN	West coasts in middle latitudes	Dry, sunny, warm summers; mild, wetter winters; rain averages 15–20 inches (30–50 cm) a year	Scrub woodland and grassland
	HUMID SUBTROPICAL	East coasts in middle latitudes	Humid with hot summers and mild winters; rain year-round; in paths of hurricanes and typhoons	Mixed forest
	MARINE WEST COAST	West coasts in the upper-middle latitudes	Cloudy, mild summers and cool, rainy winters; strong ocean influence	Evergreen forests
	HUMID CONTINENTAL	East coasts and interiors of upper-middle latitudes	Four distinct seasons; long, cold winters and short, warm summers; average precipitation varies	Mixed forest



Polar climate



Dry climate

Climate		Where is it?	What is it like?	Plants
Polar	SUBARCTIC	Higher latitudes of the interior and east coasts of continents	Extremes of temperature; long, cold winters and short, warm summers; little precipitation	Northern ever-green forests
	TUNDRA	Coasts in high latitudes	Cold all year; very long, cold winters and very short, cool summers; little precipitation; permafrost	Moss, lichens, low shrubs
	ICE CAP	Polar regions	Freezing cold; snow and ice; little precipitation	No vegetation
Highland	HIGHLAND	High mountain regions	Wide range of temperatures and precipitation amounts, depending on elevation and location	Ranges from forest to tundra

map zone
Geography Skills

Regions Note how Earth's climate regions relate to different locations.

- 1. Locate** Which climates are found mainly in the Northern Hemisphere?
- 2. Identify** What climate does most of northern Africa have?

3. Make Generalizations Where are many of the world's driest climates found on Earth?

4. Interpreting Charts Examine the chart. Which two climates have the least amount of vegetation?