Middle-Latitude Climates

North America stretches from Central America, in the tropical climate zone, to northern Canada and Alaska, in the polar climate zone. However, the contiguous United States and southern Canada lie in the middle latitudes.

The climates of the various parts of the United States differ greatly. Wave cyclones bring most of the precipitation that falls on the United States and Canada. Because this precipitation falls unevenly across these two countries, they have several different middle-latitude climate types.

Marine West-Coast Climate

Between 40° and 60° north latitude, the Pacific Northwest of the United States has a **marine west-coast climate.** This land is in the belt of prevailing westerly winds of cool, moist maritime polar air. As these winds move east from the Pacific Ocean, the west coast receives precipitation. The coasts of Washington, Oregon, and northern California, where mountains block the movement of moist air toward the east, receive a great deal of moisture. The average yearly precipitation is 60 cm to 150 cm. The average temperature is a relatively cool 20°C in summer and a relatively mild 7°C in winter. The yearly temperature range is only 13°C. Most regions with a marine west-coast climate are covered with dense forests of cone-bearing trees.

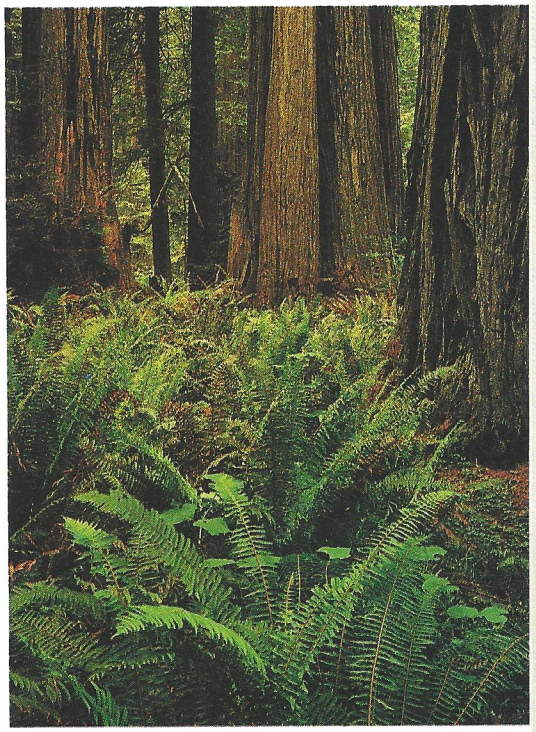


Figure 26–7. The heavy rains of a marine west-coast climate help to maintain the growth of dense forests, such as this one in Prairie Creek Redwoods State Park in northern California.

Mediterranean Climate

Regions along the central and southern California coast have a climate like that of the coast of the Mediterranean Sea. This climate is thus called a **Mediterranean climate.** Regions with a Mediterranean climate are located between regions with a tropical-desert climate and those with a marine west-coast climate. They generally lie between 30° and 40° latitude. These regions have dry summers and wet winters. In the summer, the dry air of the subtropical highs blows over the region. In the winter, this pressure belt shifts southward, bringing wave cyclones to the region. Almost all of the yearly rainfall—an average of 40 cm—falls during the mild winter months. The yearly temperature range is small—only 7°C—with average summer temperatures of 21°C and average winter temperatures of 14°C.

Middle-Latitude Desert and Steppe Climates

Two types of middle-latitude dry climates are found between 35° and 50° north latitude in the interiors of Asia and North America. They are the **middle-latitude desert** and the **middle-latitude steppe climates.** Much of the land in the western United States, other than the coasts and mountains, has a middle-latitude desert climate. Little precipitation—less than 25 cm—falls annually in these deserts. Unlike tropical deserts, middle-latitude deserts have a winter season that may be quite cold and a summer season that ranges from warm to very hot. The vegetation of North American middle-latitude deserts consists of widely scattered drought-resistant shrubs and cacti.

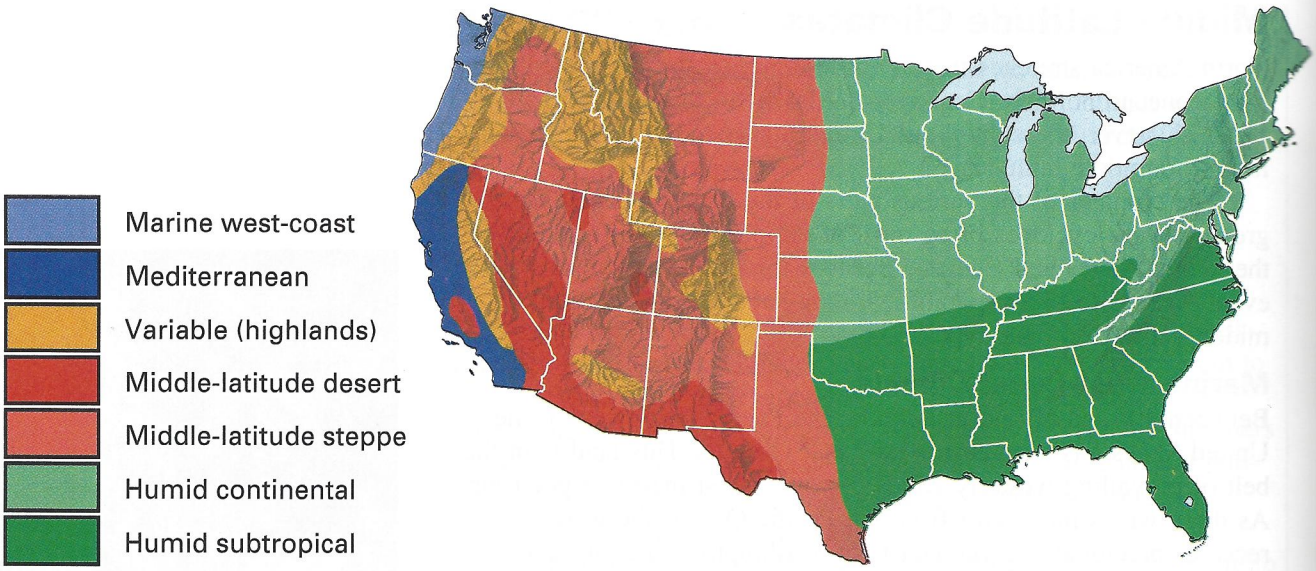


Figure 26–8. This map shows the distribution of the middle-latitude climates in the contiguous United States.

From the western United States, the dry air moves eastward. When it reaches the central part of the continent, it begins to pick up moisture from the maritime tropical gulf air moving northward.

At elevations of 1,200 m to 2,100 m, steppes gradually replace western deserts. Steppes receive 25 cm to 50 cm of rain a year, which supports a dense growth of grasses. The yearly temperature range is high—24°C. The average summer temperature is 23°C, and the average winter temperature is −1°C. As shown in Figure 26–8, the Great Plains, located to the east of the Rocky Mountains, have a steppe climate.

Humid Continental Climate

The wetter regions east of the steppe climate and extending to the east coast in North America and Asia have a **humid continental climate.** The location of the North American humid continental climate is shown in Figure 26–8. Areas with this type of climate are subject to both cold, dry continental polar air masses and warm, moist maritime tropical air masses. Summers are usually warm and humid as maritime tropical air masses move north. Winters are commonly very cold as continental polar air masses move south. When these air masses meet, weather conditions may change rapidly and violently. Seasonal changes are great, with yearly temperature ranges as great as 30°C. Average summer temperatures are as high as 25°C, and average winter temperatures as low as −5°C. Yearly average precipitation, mostly from wave cyclones and summer thunderstorms, is at least 75 cm. Forests of hardwood and softwood trees are found in a humid continental climate.

Humid Subtropical Climate

The southeastern coasts of continents located between 30° and 40° north and south latitude have a **humid subtropical climate.** The southeastern coast of the United States, shown in Figure 26–8, is

one of these areas. In the summer, moist maritime tropical air masses move north across this region. These air masses bring warm, humid weather, heavy rains, and occasional hurricanes. In the winter, continental polar air masses moving from inland regions may bring brief but intense cold. For example, Charleston, South Carolina, has an average summer temperature of 27°C and an average winter temperature of 10°C. However, the temperature occasionally has plunged to −15°C in Charleston. The yearly temperature range in a humid subtropical climate is a relatively small 17°C. Annual precipitation in a humid subtropical climate is between 75 cm and 165 cm. The land in a humid subtropical climate is usually covered with dense forest.

Local Climates

The climate in any particular place may be influenced by local conditions as well as by the major factors that have been discussed. The elevation of the land, especially high mountain ranges and plateaus, is the most important factor affecting local weather conditions.

Large lakes influence local climates, and like oceans, they moderate temperatures. They can also cause an increase in precipitation on the shore farthest from the prevailing wind. For example, the eastern shore of Lake Michigan generally has more moderate temperatures, more cloudiness, and higher precipitation than the western shore does. Forests affect local climates by reducing the speed of the wind and by increasing the humidity.

Cities are *microclimates*. That is, they are small regions with their own local climate characteristics. In a city, the average temperature is 1°C to 2°C higher than that in surrounding rural areas. There are several reasons for this phenomenon. During the day, vegetation absorbs solar energy and gives off water vapor by transpiration. Because cities contain far less vegetation than rural areas do, less transpiration occurs, and therefore, more solar energy is available to heat the air. At night the air over cities is warmed by radiation from the materials in streets and buildings that have been heated during the day. Heavy traffic and the energy used for heating, lighting, and industry may also raise the air temperature in cities. More precipitation falls within cities and in areas downwind of cities than in rural areas. Dust, smoke, and other pollutants, carried into clouds by rising warm city air, form nuclei around which raindrops condense.

26.2 Section Review

1. Where do tropical desert climates occur?
2. In which type of climate does the largest yearly temperature range occur?
3. List the types of middle-latitude climates that occur in the contiguous United States and Canada.
4. A city in a middle-latitude desert climate might have the weather conditions of a steppe climate. Why?

Chapter 26 Review

Key Terms

- bora (528)
- chinook (528)
- foehn (528)
- humid continental climate (534)
- humid subtropical climate (534)
- marine west-coast climate (533)
- Mediterranean climate (533)
- middle-latitude climates (529)
- middle-latitude desert climate (533)
- middle-latitude steppe climate (533)
- mistral (528)
- monsoon (527)
- polar climates (529)
- specific heat (526)
- subarctic climate (532)
- temperature range (523)
- tropical climates (529)
- tropical desert climate (529)
- tropical rain forest climate (529)
- tropical savanna climate (529)
- tundra climate (532)

Key Concepts

Latitude determines the angle at which the sun's rays strike the earth. **See page 523.**

The different rates at which land and water are heated, the temperature of ocean currents, and seasonal winds all affect climate. **See page 526.**

The temperature and moisture content of the air are influenced by altitude and by the presence of mountains. **See page 528.**

The three types of tropical climates are based on different amounts of precipitation. **See page 529.**

Regions with subarctic and tundra climates receive little precipitation. **See page 532.**

Several types of middle-latitude climates occur in the contiguous United States and southern Canada. **See page 533.**

Industries, radiation from building materials, and lack of vegetation modify the climates of cities. **See page 535.**

Review

On your own paper, write the letter of the term that best completes each of the following statements.

1. At the equator the sun's rays always strike the earth
   a. at a low angle. b. at nearly a 90° angle.
   c. 18 hours each day. d. no more than 8 hours each day.
2. Nights are longest in the winter and shortest in the summer
   a. at the equator. b. at high altitudes.
   c. in the middle of the ocean. d. at the poles.
3. Water cools
   a. more slowly than land does.
   b. more quickly than land does.
   c. through the process of transpiration.
   d. because of waves and currents.
4. Ocean currents influence temperature by
   a. eroding shorelines.
   b. heating or cooling the air.
   c. washing warm, dry sediments out to sea.
   d. dispersing the rays of the sun.
5. Winds that blow in opposite directions in different seasons because of the differential heating of the land and the oceans are called
   a. chinooks. b. mistrals.
   c. monsoons. d. wave cyclones.

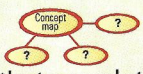
6. When a moving air mass encounters a mountain range, it
   a. stops moving. b. slows and sinks.
   c. rises and cools. d. reverses its direction.
7. Tropical deserts exhibit all of the following characteristics except
   a. location between 20° and 30° latitude.
   b. dense plant growth.
   c. influence of the subtropical highs.
   d. extremely dry conditions.
8. A tropical climate that is characterized by very wet summers and very dry winters is called
   a. a Mediterranean climate. b. a savanna climate.
   c. a trade-wind climate. d. an equatorial climate.
9. In regions with a Mediterranean climate, almost all the yearly precipitation falls
   a. during monsoons. b. in the summer.
   c. in the winter. d. during hurricanes.
10. Weather conditions tend to fluctuate rapidly throughout the year in a
   a. subarctic climate. b. middle-latitude desert climate.
   c. Mediterranean climate. d. humid continental climate.
11. The various structures and activities in cities affect the local climate by
   a. decreasing the average temperature.
   b. increasing both the average temperature and precipitation.
   c. increasing the average temperature and decreasing the precipitation.
   d. decreasing the precipitation.

Critical Thinking

On your own paper, write answers to the following questions.

1. The Milankovitch theory states that a periodic change in the tilt of the earth's axis was one factor in the onset of the ice ages. Use what you know about the factors affecting climate to explain how an ice age might have occurred.
2. If you enjoy a warm, dry climate all year but do not like the sparse vegetation in deserts, in what climate or climates would you live? Assume that you would not mind moving one or more times a year.
3. Explain why the vegetation in areas with a tundra climate is sparse, even though these areas receive precipitation that is adequate to support plant life.
4. Why do weather conditions change rapidly in a humid continental climate and remain relatively constant in the other middle-latitude climates?
5. Explain why the classification of climates often fails when you think only in terms of a specific location.

Application

1. Imagine you are going to build a vacation house near a coast with a warm offshore current. What must you investigate to determine how the current will affect the temperature on land? Explain your answer.
2. Suppose your family was moving to the mountains, but you do not like humid weather. Should you encourage them to find a house on the side of the mountains facing toward or away from the prevailing winds? Explain why.
3. 

Construct a **concept map** that correlates the various climates you learned about in this chapter with their geographical locations on the earth.

Extension

1. At the library, locate old copies of the local newspaper. Record the daily high and low temperatures for a summer month and a winter month during the past year. Graph the information and calculate the yearly temperature range. Report your findings to the class.
2. Use the information you have learned about climate zones to draw a map showing variation in vegetation around the world. Include areas with little or no vegetation as well as those with various types of vegetation. Share your map with the class.