What Is the Temperate Zone?

The climate zone between the tropical and the polar zones is the **temperate zone**. This zone extends from about 23.5° to about 66.5° north or south latitudes. Most of the continental United States is in the temperate zone. The temperate zone receives less solar energy than the Tropics. Therefore, temperatures in the temperate zone tend to be lower than those in the Tropics.

The four main biomes in the temperate zone are temperate forests, temperate grasslands, chaparrals, and temperate deserts. All of these biomes show seasonal changes in weather. However, some biomes have more extreme weather changes than others. For example, some areas in the United States have similar temperatures all year long. Other areas have very low temperatures in the winter and very high temperatures in the summer.

**BEFORE YOU READ**

After you read this section, you should be able to answer these questions:

- What biomes are found in the temperate zone?
- What biomes are found in the polar zone?
- What are two examples of microclimates?

**STUDY TIP**

Compare After you read this section, make a table comparing the four main temperate biomes.

**READING CHECK**

1. **Identify** What do the four main temperate biomes have in common?

2. **Read a Map** What kind of biome is found in northern and southern Africa?

**TAKE A LOOK**
TEMPERATE FORESTS

Temperate forests tend to have high amounts of rainfall and large seasonal temperature differences. The summers are warm, and the winters are cold. Animals that live in temperate forests include foxes, deer, and bears. Some trees in temperate forests lose their leaves each winter. These trees are called *deciduous* trees. Other trees, called *evergreens*, do not lose all of their leaves at once.

The soils in most temperate forests are very rich in nutrients. This is because the deciduous trees drop their leaves every winter. As the leaves decay, nutrients are added to the soil.

Temperate Forest

- **Average Temperature Range**: 0°C to 28°C (32°F to 82°F)
- **Average Yearly Precipitation**: 76 cm to 250 cm
- **Soil Characteristics**: very fertile, organically rich

TEMPERATE GRASSLANDS

Temperate grasslands have warm summers and very cold winters. Few trees grow in temperate grasslands because they do not receive enough rain. Animals that live in temperate grasslands include bison and kangaroos.

Of all the land biomes, temperate grasslands have the most fertile soil. As a result, much of the grassland on Earth has been plowed up to make room for crops.

Temperate Grassland

- **Average Temperature Range**: –6°C to 26°C (21°F to 78°F)
- **Average Yearly Precipitation**: 38 cm to 76 cm
- **Soil Characteristics**: most-fertile soils of all biomes

**Critical Thinking**

3. **Infer** A student visits a forest in Vermont in January. Most of the trees in the forest are covered with leaves. Are the trees probably deciduous trees or evergreens? Explain your answer.

   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

**TAKE A LOOK**

4. **Identify** What is the main kind of plant that grows in temperate grasslands?
CHAPARRALS
Chaparral regions have cool, wet winters and hot, dry summers. Animals that live in the chaparral include mountain lions, coyotes, and quail.

Fires are common during the summers in chaparrals. Some chaparral plants are adapted to these fires. Chaparral plants also have adaptations that prevent water loss during dry conditions. For example, the main kinds of plants in the chaparral are evergreen shrubs. These shrubs have thick leaves with waxy coatings. The coatings help prevent the leaves from losing water.

TEMPERATE DESERTS
Like tropical deserts, temperate deserts are hot in the daytime and receive little rainfall. However, temperate deserts tend to have much colder nights than tropical deserts. This is because temperate deserts tend to have low humidity and cloudless skies. These conditions allow solar energy to heat the surface a lot during the day. They also allow heat to move into the atmosphere at night.

Plants that live in temperate deserts include cacti, shrubs, and thorny trees. Animals include lizards, snakes, bats, and toads.

**READING CHECK**

5. Describe What adaptation do evergreen shrubs in the chaparral have to survive dry conditions?

6. Compare How are temperate deserts different from tropical deserts? Give one way.
**What Is the Polar Zone?**

The **polar zone** is located between 66.5° and 90° north and south latitudes, near the North and South Poles. This zone has the coldest temperatures of all climate zones. There are two biomes in the polar zone: tundra and taiga.

**TUNDRA**

The tundra has long, cold winters and short, cool summers. In the summer, only the top meter of soil thaws out. Below this depth is a permanently frozen layer called **permafrost**. It prevents water in the thawed soil from draining away. Therefore, the upper soil is muddy in the summer. Insects like mosquitoes thrive there. Birds migrate there in the summer to eat the insects.

Other animals that live in the tundra include caribou, reindeer, and polar bears. Only small plants, such as mosses, live in the tundra.

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**TAKE A LOOK**

7. **Identify** On which continents is taiga found?

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**READING CHECK**

8. **Explain** Why is the upper soil in the tundra muddy during the summer?
TAIGA

Taiga biomes are found just south of tundra biomes in the Northern Hemisphere. The taiga has long, cold winters and short, warm summers. Animals that live in the taiga include moose, bears, and rabbits.

Evergreen trees called conifers, such as pine and spruce, are the main plants that grow in the taiga. The needle-like leaves from these trees contain acidic substances. When the needles die and decay on the ground, these substances make the soil acidic. Not very many plants can grow in acidic soils. Therefore, few plants grow on the forest floor of the taiga.

What Are Microclimates?

Remember that latitude, topography, and water help determine the climate of an area. Local conditions can also affect the climate in smaller areas. A microclimate is the climate of a small area. Two examples of microclimates are alpine biomes and cities.

Alpine biomes are cold microclimates found near the tops of mountains. In winter, the temperatures are below freezing. In summer, they range from 10°C to 15°C. It is the high elevations of alpine biomes that cause them to be so cold. Alpine biomes are even found on mountains in the Tropics.

Cities are also microclimates. Buildings and pavement are made of dark materials. They absorb solar energy and stay warm. City temperatures can be 1°C to 2°C warmer than temperatures in other areas.

Say It

Share Experiences In a small group, talk about different biomes that you or your classmates have visited.

Math Focus

9. Convert How much precipitation does the taiga get per year in inches?

1 in. = 2.54 cm

READING CHECK

10. Define What is a microclimate?
Section 3 Review

SECTION VOCABULARY

<table>
<thead>
<tr>
<th>microclimate</th>
<th>the climate of a small area</th>
</tr>
</thead>
<tbody>
<tr>
<td>polar zone</td>
<td>the North or South Pole and the surrounding region</td>
</tr>
<tr>
<td>temperate zone</td>
<td>the climate zone between the Tropics and the polar zone</td>
</tr>
</tbody>
</table>

1. **List** What are the four biomes of the temperate zone?

2. **Identify** At what latitudes is the temperate zone found?

3. **Explain** Why are temperate deserts very hot during the day but very cold at night?

4. **Explain** Why do cities often have higher temperatures than surrounding rural areas?

5. **Explain** Why are most taiga soils acidic?

6. **Compare** How are temperate deserts and the tundra similar?

7. **Explain** Why do few trees grow in temperate grasslands?
Review

1. Climate describes the average weather conditions in an area over a long period of time. Weather describes the state of the atmosphere in a specific location at a specific point in time.

2. San Diego receives more sunlight because it lies closer to the equator.

3. Earth is tilted on its axis of rotation, causing some areas to receive more sunlight during some parts of the year than during others.

4. latitude, large bodies of water, topography, ocean currents, winds

5. Air rises to move over a mountain. The air cools as it rises, causing the water vapor in the air to condense into clouds. Precipitation falls on the windward side of the mountain, causing the area to have a wet climate. The air rises over the mountain and sinks. As it sinks, it gets warmer and causes water to evaporate from the land on the other side of the mountain. As a result, the far side of the mountain has a dry climate.

SECTION 2 THE TROPICS

1. They receive different amounts of rain and have different kinds of soil.
2. between 23.5°N and 23.5°S latitude
3. It gets about the same amount of sunlight all year long.
4. Nutrients are quickly used up by plants or washed away by rain.
5. Possible answer: Many plants would die out because they rely on fires for survival or reproduction.
6. about 3 ft
7. The temperature in a desert can be much lower at night than during the day.

Review

1. tropical rain forest, tropical desert, tropical savanna
2. high temperatures
3. First row, from left to right: over 200 cm per year, fern
   Second row, from left to right: tropical savanna, poor, thorny shrub
   Third row, from left to right: tropical desert, less than 25 cm per year, scorpion
4. No, because it is not located in the Tropics.
5. Africa
6. tropical deserts have the largest temperature range; tropical rain forests have the smallest temperature range.

SECTION 3 TEMperate AND POLAR ZONES

1. They all experience seasonal changes in weather.
2. chaparral
3. They are probably evergreens, because they still have leaves in the winter and they are found in a temperate forest.
4. grass
5. waxy coatings on leaves to prevent water loss
6. Possible answer: Temperate deserts have a larger temperature range.
7. North America, Asia, Europe
8. The ice in it melts, but the permafrost prevents the water from draining away.
9. 16 in. to 24 in.
10. the climate of a small area

Review

1. temperate forest, temperate grassland, chaparral, temperate desert
2. between 23.5° and 66.5° north or south latitudes
3. They have clear skies and low humidity. This allows the land to heat up a lot during the day and the heat to move easily into the atmosphere at night.
4. The pavement and other structures in cities absorb solar energy and heat up, causing the climate to be warmer.
5. The main plants in the taiga are evergreens with acidic compounds in their leaves. When the leaves fall to the ground and decay, they make the soils acidic.
6. They both receive little to no precipitation.
7. They do not get enough rain.

SECTION 4 CHANGES IN CLIMATE

1. An ice age is a time period in which glaciers are found at lower latitudes than at other times.
2. Ocean water freezes to form ice. As a result, global sea level drops, exposing more land.