Chapter 2 Notes Earth's Physical Geography

Section 1: Forces Shaping the Earth

Physical processes shape the Earth's surface. Forces from within and the actions of wind, water, and ice have shaped Earth's surface.

Inside the Earth

The Earth is made up of several layers that have different characteristics.

- The Earth has layers like a melon or a baseball. The center is a dense solid **core** of hot iron mixed with other metals and rock.
- The next layer, the outer core, is so hot that the metal has melted into a liquid.
- Around the core is a layer of hot dense rock about 1,770 miles thick called the **mantle**.
- The area nearest the core is solid, but the rock in the outer mantle can be moved, shaped, and melted.
- Melted rock from the mantle is called **magma**.
- It flows to the surface during a volcanic eruption. Once it reaches the surface, magma is called lava.
- A rocky shell forms the Earth's surface and is called the **crust**.
- This uppermost layer includes the ocean floors and seven land areas known as **continents**.

Shaping the Earth's Surface

Forces acting both inside and outside the Earth work to change the appearance of the Earth's surface.

- Because the Earth's crust is in slow, constant motion, it changes over time.
- Old mountains are worn down, while new mountains grow taller. The continents move as well.
- By studying **plate tectonics**, you can understand how the continents were formed and why they move.
- Each continent sits on one or more large land bases called plates.
- As these plates move, the continents also move.
- This movement is called continental drift. The drift can be as little 1 (2.54 cm) inch to as much as 7 inches (17.78 cm) per year.
- Sometimes the plates pull away from each other, and sometimes they collide.
- When plates collide, the land where the plates meet rises and forms mountains.
- Collisions of continental and oceanic plates cause magma to erupt. When the magma hardens, the result is volcanic mountains.
- **Earthquakes** are sudden and violent movements of the Earth's crust.

- They are common in areas such as the Pacific Ocean. Here the collision of ocean and continental plates makes the Earth's crust unstable.
- When plates move alongside each other, the movement makes cracks in the Earth's crust called **faults**.
- Movements along faults may happen in sudden bursts that cause earthquakes.
- Another natural force that changes landforms is called **weathering**.
- During this process, water and ice, chemicals, and even plants break rocks apart into smaller pieces.
- Forces such as water, wind, and ice can move weathered rock in a process called **erosion**.

Section 2: Landforms and Water Resources

Geographic factors influence where people settle. Physical features determine where people live.

Types of Landforms

Earth has a variety of landforms, and many of the landforms can be found both on the continents and the ocean floors.

- Mountains, the highest landforms, range in height from a few thousand feet to nearly 30,000 feet (9144 m).
- Hills are lower and more rounded than mountains.
- Other landforms are valleys and flatlands.
- A valley is lower than the land on either side and lies between mountains and hills.
- Flatlands occur in one of two forms.
    - Plains are flat lowlands, typically found along coasts and lowland river valleys.
    - Plateaus are flatlands at higher elevations.
- Geographers define some landforms by their relationship to bodies of water. Examples are an isthmus, a peninsula, and an island.
- Off each coast of a continent lies a plateau called a **continental shelf** that stretches for several miles underwater.
- Mountains also are found underwater.
- Tectonic activity makes deep cuts in the ocean floor called **trenches**.
- A well-known trench is the Mariana Trench in the western Pacific Ocean.
- Humans settle on all types of landforms.
- Factors that help people decide where to live include climate and the availability of freshwater and food sources.

The Water Planet

Water covers much of the planet, but only some of this water is usable.

- About 70 percent of the Earth's surface is covered with water.
- Almost 97 percent of the Earth's water is salt water.
- Narrow bodies of water called straits or channels link seas, bays, and gulfs to the oceans.
- Only 3 percent of the water on Earth is freshwater.
- Much of this freshwater is frozen in ice that covers polar regions and parts of mountains.
- Some freshwater is **groundwater**, which filters through the soil into the ground.
- Groundwater often gathers in **aquifers**, or underground layers of rock through which water flows.
- Lakes are large inland bodies of water.
- Rivers are long, flowing bodies of water.
- Rivers begin at a source and end at a mouth.
- The mouth is the place where a river empties into another body of water, such as an ocean or a lake.
- The largest rivers often have many tributaries, which are separate streams or rivers that feed into them.
- Many rivers form deltas at their mouths by depositing soil.
    - Here a river breaks into many different streams flowing toward the sea.
- The water on Earth moves constantly in a process called the **water cycle**.
- The sun drives the water cycle because it **evaporates** water, turning water from a liquid to a gas called water vapor.
- **Condensation** occurs when cool temperatures change water vapor back to a liquid.
- When the liquid form falls to Earth, it is called **precipitation**.
- The cycle is completed when **collection** takes place in rivers, lakes, and oceans.

Section 3: Climate Regions

Geographers organize the Earth into regions that share common characteristics. Geographers use climate to define world regions.

Effects on Climate

Sun, wind, and water influence Earth's climate.

- **Weather** refers to the changes in temperature, wind direction and speed, and air moisture that take place over a short period of time.
- **Climate** is the usual, predictable patterns of weather in an area over many years.

- The sun does not heat the Earth evenly. The movement of air and water over the Earth helps to distribute heat more evenly around the planet.
- Air in the Tropics, which is warmed by the sun, moves north and south toward the Poles of the Earth.
- Colder air from the Poles moves toward the Equator. These movements of air are winds.
- Major wind systems follow patterns that are similar over time and are called **prevailing winds**.
- The winds that blow from east to west between the Tropics and the Equator are called trade winds.
- The westerlies, which blow over North America, move from west to east.
- When moist, warm air rises suddenly and meets dry, cold air, major storms can develop.
- These storms in the summer can include thunder and lightning, heavy rain, and, sometimes, tornadoes.
- Tornadoes are violent, funnel-shaped windstorms with wind speeds up to 450 miles per hour.
- Hurricanes are destructive storms that occur in the western Atlantic and eastern Pacific Oceans. Typhoons occur in the western Pacific Ocean.
- The steadily flowing streams of water in the world's seas are called **currents**.
- Like prevailing winds, currents follow patterns.
- Every few years, changes in normal wind and water patterns in the Pacific Ocean alter weather patterns in many parts of the world.
- Two sets of conditions, **El Niño** and **La Niña**, cause heavy rains in some parts of the world and droughts in other parts.

Landforms and Climate

Landforms, especially mountains, can affect winds, temperature, and rainfall.

- The types of landforms and their nearness to water influence climate.
- Some landforms cause **local winds**, or wind patterns typical only in a small area.
- Some local winds occur because land warms and cools more quickly than water does. Local winds also occur near tall mountains.
- Mountain peaks are cold and have snow even in the Tropics because high mountain air is thin and cannot hold heat.
- Mountains have an effect—called a **rain shadow**—whereby they block rain from reaching interior regions.

Climate Zones

The effects of wind, water, latitude, and landforms combine to create different climate zones.

- Many parts of the world, even though they are very distant from one another, have similar climates.

- This is known as having the same **climate zone**, or similar patterns of temperature, precipitation, and vegetation.
- Climate zones include **biomes**, or areas such as rain forest, desert, grassland, and tundra, in which particular kinds of plants and animals have adapted to particular climates.
- The five major climate zones are tropical, dry, midlatitude, high latitude, and highland.
- All but the highland zone have several subcategories. For example, the tropical zone includes the subcategories of tropical rain forest and tropical savanna.
- Large cities show significant climate differences from surrounding areas in their zone.
- These **urban climates** have higher temperatures due to paved streets and stone buildings that soak up and then release more of the sun's heat energy than areas covered by plants.
- The different heat patterns in urban climates also cause winds to blow into cities from several directions instead of the prevailing direction experienced in rural areas.
- It is possible that cities have more precipitation than rural areas, too.

Section 4: Human-Environment Interaction

All living things are dependent upon one another and their surroundings for survival. Human actions greatly affect the natural world.

The Atmosphere

Human activity can have a negative impact on the air.

- People burn oil, coal, or gas to make electricity, power factories, and move vehicles. These actions often cause air pollution.
- Air pollution takes several forms.
- Some polluting chemicals combine with ozone, a form of oxygen, to create **smog**. Smog is a thick haze of smoke and chemicals.
- Chemicals combine with precipitation to form **acid rain**.
- Acid rain kills fish, eats away at the surfaces of buildings, and destroys trees.
- Another form of pollution is from human-made chemicals, particularly chlorofluorocarbons (CFCs), which destroy the ozone layer.

The Lithosphere

Some human activity damages our environment.

- The lithosphere is another name for the Earth's crust. It includes all the land above and below the oceans.
- Rich topsoil is a vital part of the lithosphere.
- Farming, logging, and mining, if not managed properly, can have a negative effect on topsoil.

- Farmers can reduce the loss of topsoil.
- One way is through contour plowing, or plowing along the curves of the land rather than in straight lines. This prevents the soil from washing away.
- Another way is **crop rotation**, or changing what is planted from year to year.
- A third way is to plant grasses in empty fields to hold the soil in place.
- **Deforestation**, or cutting down forests without replanting them, is another way topsoil is lost.
- When the tree roots are no longer there to hold the soil in place, wind and water can carry away the soil.

The Hydrosphere and Biosphere

Water pollution poses a threat to a vital and limited resource.

- The hydrosphere includes the Earth's surface water and groundwater.
- The amount of freshwater on Earth is limited, so people should practice **conservation**, or the careful use of a resource, to avoid wasting water.
- The water supply is harmed in several ways.
- The water used in **irrigation**, a process in which water is collected and distributed to crops, is often lost through evaporation.
- Pollution from industrial plants and **pesticides** is also harmful.
- Pesticides are powerful chemicals that farmers use to kill crop-destroying insects.
- The biosphere includes all the plants and animals on Earth.
- The biosphere is divided into ecosystems.
- An **ecosystem** is a place shared by plants and animals that depend on one another for survival.
- Changes to ecosystems can lead to shrinking **biodiversity**, or the variety of plants and animals living on the planet.

Maps, Charts, & Graphs

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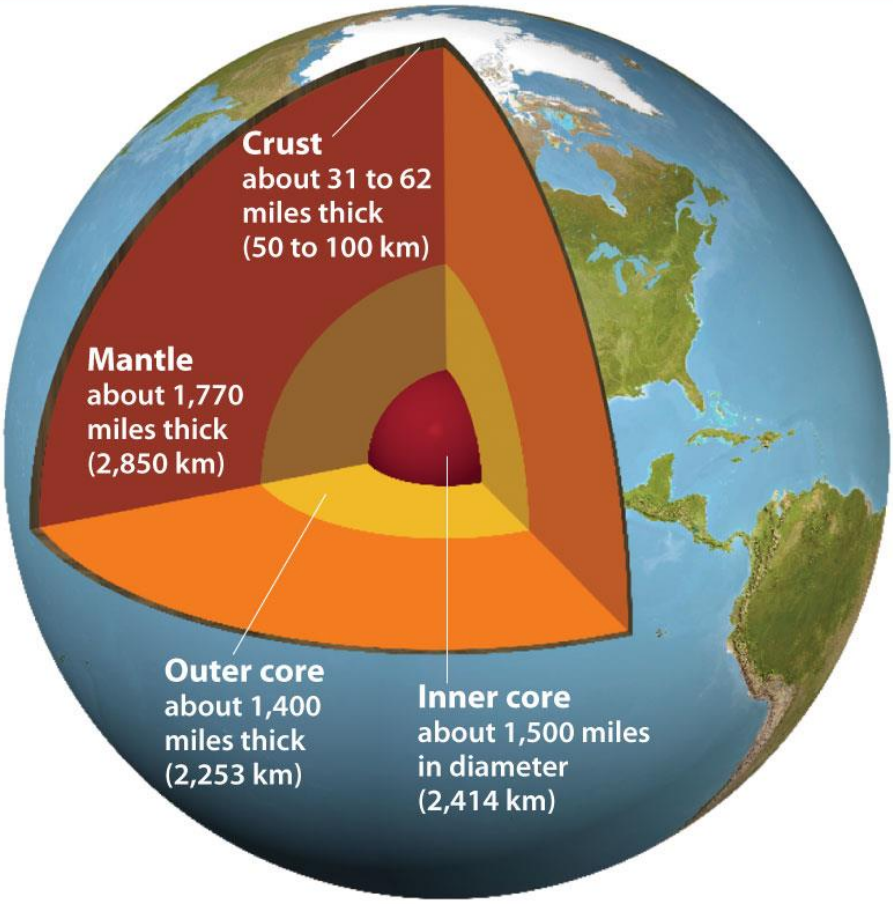
Figure 1 **Earth's Layers**



Source: *NGS Almanac of Geography.*

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Figure 2 **Tectonic Plate Boundries**

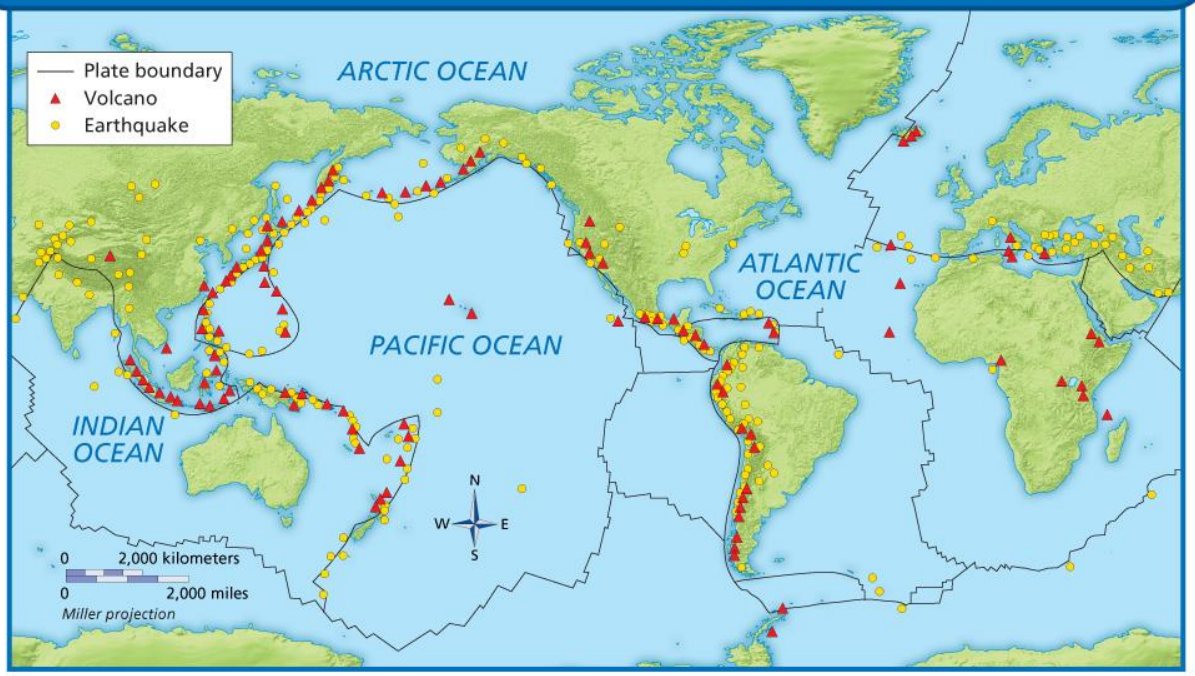

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Figure 3 **The Water Cycle**

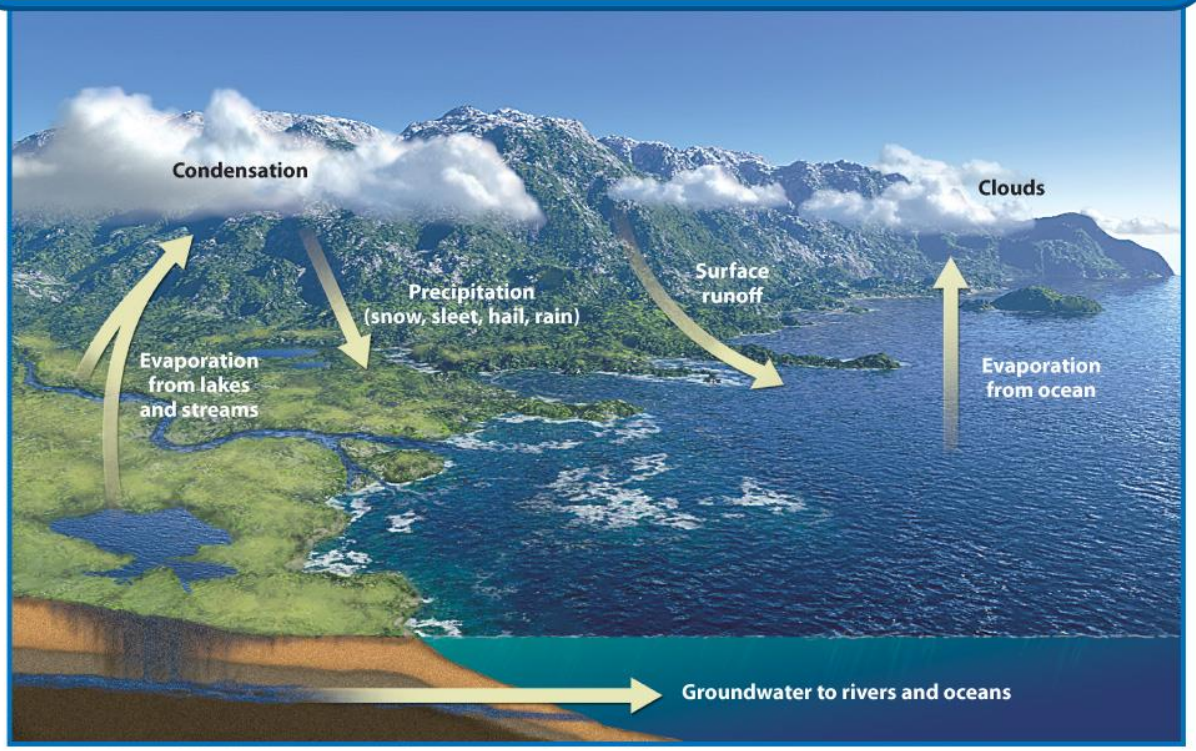

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Figure 4 Prevailing Wind Patterns

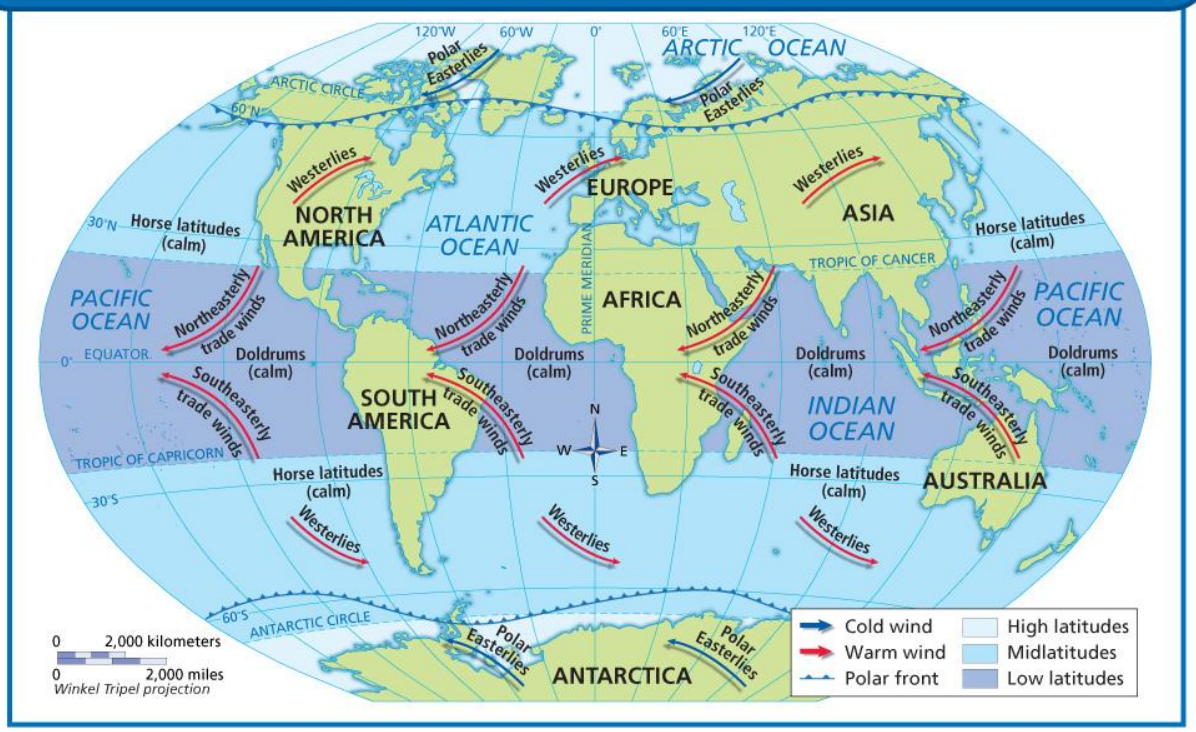

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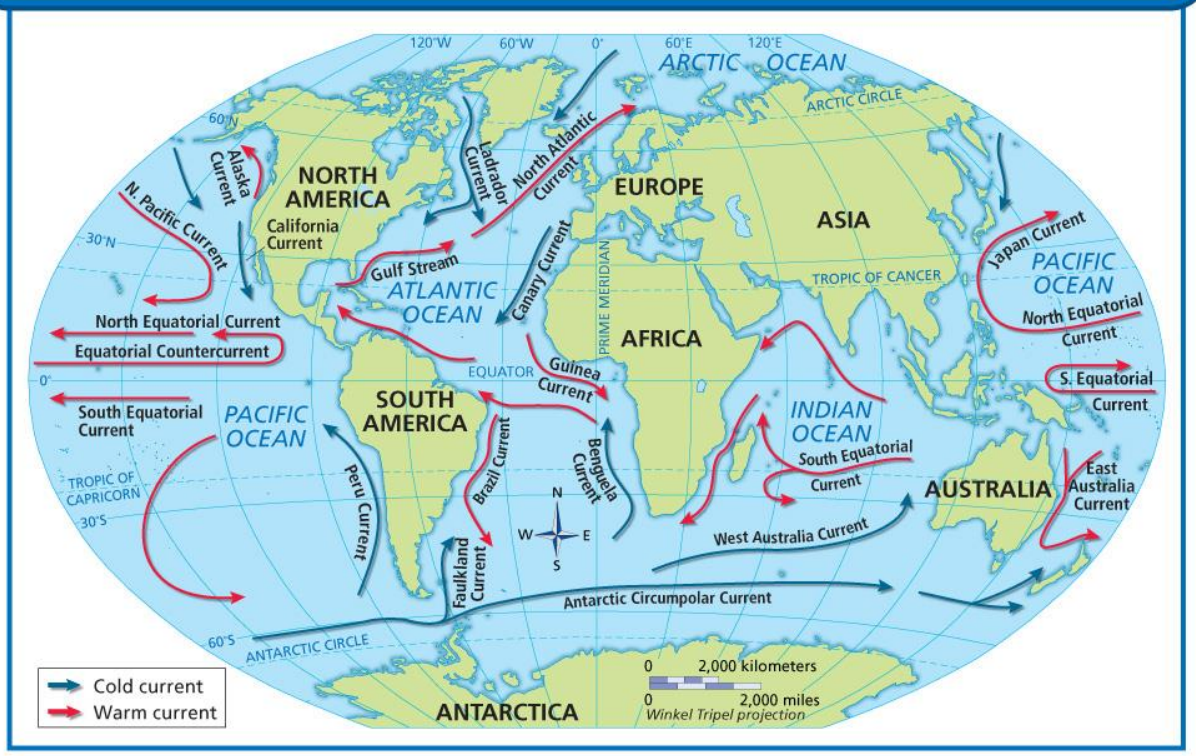
Figure 5 **World Ocean Currents**



World Climate Zones

Category	Subcategory	Characteristics	Vegetation	Example
Tropical	Tropical rain forest	Warm temperatures; heavy rainfall throughout year	Dense rain forests	Amazon basin (South America); Congo basin (Africa)
	Tropical savanna	Warm temperatures throughout year; dry winter	Grasslands dotted by scattered trees	Southern half of Brazil; eastern Africa
Dry	Steppe	Temperatures can be warm or mild; rainfall low and unreliable	Grasses, shrubs	Western Great Plains (United States); Sahel region south of the Sahara (Africa)
	Desert	Temperatures can be warm or mild; rainfall very low and very unreliable	Drought-resistant shrubs and bushes	Sonoran Desert (southwestern United States, Mexico); Sahara (Africa)

World Climate Zones

Category	Subcategory	Characteristics	Vegetation	Example
Midlatitude	Marine west coast	Cool summers, mild winters; ample rainfall	Deciduous or evergreen forests	Northwestern United States; northwestern Europe
	Mediterranean	Warm, dry summers; mild, wet winters	Shrubs, low trees, drought-resistant plants	Southern California; Mediterranean region (Europe)
	Humid subtropical	Hot, wet summers; mild, wet winters	Mixed forests	Southeastern United States; eastern China
	Humid continental	Hot, wet summers; cold, somewhat wet winters	Deciduous forests	Northeastern United States; eastern Europe; western Russia

World Climate Zones

Category	Subcategory	Characteristics	Vegetation	Example
High Latitude	Subarctic	Short, mild summers; long, cold winters; light precipitation	Coniferous forests	Most of Alaska, Canada; western Russia
	Tundra	Short, cool summers; long, cold winters; precipitation varies	Low-lying grasses, mosses, shrubs	Extreme north of North America; Europe
	Ice cap	Cold all year long	None to very little	Greenland; Antarctica
Highland		Varies depending on local conditions	Changes with altitude	Northern Rocky Mountains (United States); the Himalaya (Asia)

NATIONAL GEOGRAPHIC

Figure 7 **The Greenhouse Effect**