

Chapter 4: Global Climates and Biomes

The case study describes in 2003, Kenya experienced different rain patterns than usual, leaving one area flooded and in dire condition, and the other experienced a drought, leaving many starving and without drinking water. The message of the case study is that areas that don't have sophisticated water management systems can be harshly affected by unusual changes in weather patterns.

Sunlight hits high latitudes at an obtuse angle, causing a lot of sunlight to be reflected, making these regions colder. Whereas in the tropics, sunlight hits directly, and not as much light is reflected, resulting in higher temperatures. Albedo is a term that describes the amount of reflected sunlight on certain surfaces. Air is circulated through Hadley cells, and the earth's rotation plays a factor through the Coriolis effect. Earth's tilted axis causes variations in what parts of the earth receive sunlight, and alters seasons. Ocean currents vary between warm and cold currents, depending on the area.

Tundra: cold and treeless, covered in permafrost—frozen soil. Little plant growth, located in Greenland. Boreal forests are forests made up of evergreen trees that deal with cold winters and short growing seasons. Low precipitation, few plants except for evergreen trees. Temperate rainforest: a coastal biome, found in places like northern California to Alaska. Winters are rainy, and there is a lot of moisture from the ocean. Mild temperatures and high precipitation support very large trees that grow slowly and decompose slowly. Tropical rainforest: high average temperatures, high precipitation, and lush plant growth. Located within 20 degrees N and S of the equator. Savanna: warm temperatures and distinct wet and dry seasons. Shrubs and thin trees are common. Located in Zambia, for example. Subtropical desert: hot temperatures and extremely dry conditions, and sparse vegetation. Located in Arica, Chile or the Sahara desert in northern Africa.

Streams and rivers: flowing fresh water that may originate from underground springs or as runoff from rain or melting snow. Lakes and ponds: contain standing water, lakes are larger than ponds. Freshwater wetlands: saturated by water, but shallow enough to support standing plants like trees. Swamps are included in freshwater wetlands. Salt marshes: found along the coast in temperate climates. Can be found in estuaries, and they are some of the most productive biomes in the world, supporting much plant life. Mangrove swamps: contain trees whose roots are submerged in water, and mangrove trees are salt tolerant. Coral reefs: found in warm, shallow waters beyond the shoreline. Coral reefs are earth's most diverse marine biome. Coral bleaching is a problem in which algae inside of coral dies, leaving the outside vulnerable—turning it white. Open ocean: divided into different zones, the photic zone which is penetrable by light, and the aphotic zone which cannot be penetrated by light. Intertidal zones are spots that can vary in water levels based on the high and low tides.

4.1: weather happens on time scales from seconds to days. Climate, on the other hand, is the average weather that occurs in a given region over a long period—typically over several decades. Order of atmospheric levels from closest to farthest from the earth: troposphere (smallest), stratosphere, mesosphere, thermosphere (largest), exosphere.

4.2: biomes are described using factors such as temperature, precipitation, plant/animal species, and latitude and longitude. Productivity of a biome is determined by plant growth, precipitation, and biodiversity.

4.3: aquatic biomes are categorized by running/standing water, light penetration, fresh/salt water, and vegetation. Photic zones receive enough light for photosynthesis, while aphotic zones do not.

Albedo: Earth's average albedo—30%. Clouds albedo ranges from 10-90%. Water, depending on the sun's angle, ranges from 10-60%. Sea ice ranges from 50-90% albedo. Fresh snow ranges from 80-95%. Forest ranges from 10-20%.

Cropland, grassland ranges from 10-25%. Asphalt ranges from 5-10% albedo.

Layers of the earth's atmosphere: the troposphere is the atmospheric layer closest to earth. Because the density of air decreases with altitude, the troposphere's temperature also decreases with altitude. Temperature increases with altitude in the stratosphere because the sun's UV-B and UV-C rays warm the upper part of this layer. Temperatures in the thermosphere can reach 3,182 degrees Fahrenheit.

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Many people have a hard time remembering the order of the layers of the atmosphere. Here's an acronym: TSMTE. You can remember the troposphere coming first because tropical rainforests are on the earth—and the troposphere is the layer closest to the earth. The stratosphere comes “straight” after the troposphere. The mesosphere comes next, and can be remembered because the first three letters “mes” help you know the number of the layer. It is the only layer that has three letters before “osphere”, thus making it easy to remember as the third. The thermosphere is by far the largest layer, and you can come up with something to remember it by, seeing as it's the second to last. The exosphere is the last layer, and you can remember it as the “exit” layer.

1. In what order are the atmospheric layers from closest to the earth to farthest from the earth?
2. What is the amount of light reflected off of a surface known as?
3. Which of the following are terrestrial biomes?

Describe the importance of preserving terrestrial and aquatic biomes.