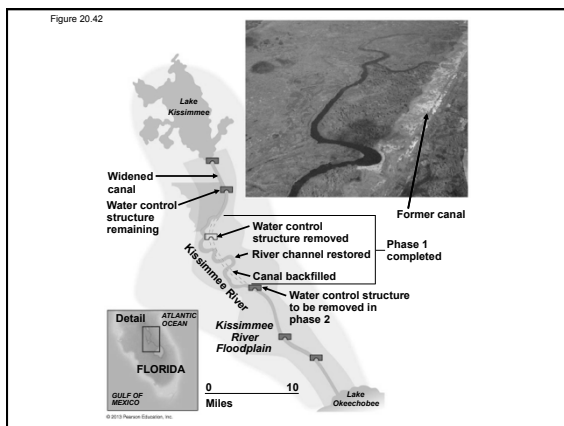


Important Word Roots		
Acclimation	Lentic	Lotic
A = At/To Climat – Climate • To adjust to new climate	• Latin lentus sluggish	• LAV, LUT, LAUT & LOT meaning WASH
Photic	Marine	
• Photo = Light	MAR, MARI, & MER meaning SEA & POOL	

Restoring Ecosystems

- The Kissimmee River was straightened into a canal between 1962 and 1971, draining the floodplain.
- The Kissimmee River restoration project is reversing the engineering of the river by
 - removing water control structures such as dams and reservoirs and
 - filling in about 35 km of the canal.
- The first phase of the project was completed in 2004.

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Conservation at the Ecosystem Level

- Conservation biology increasingly aims at sustaining the biodiversity of entire
 - communities,
 - ecosystems, and
 - **landscapes**,
 - regional assemblages of interacting ecosystems,
 - such as an area with forest, adjacent fields, wetlands, streams, and streamside habitats.


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Conservation at the Ecosystem Level

- **Landscape ecology** is the application of ecological principles to the study of land-use patterns.
- **Edges** between ecosystems
 - are prominent features of landscapes, whether natural or altered by people, and
 - have their own sets of physical conditions, such as
 - soil type and
 - surface features.



Natural edges



Edges created by human activity

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The Process of Science: How Does Tropical Forest Fragmentation Affect Biodiversity?

- **Observation:** Forests are becoming fragmented when cleared for agriculture.
- **Question:** How does fragmentation of tropical forests affect species diversity within the fragments?
- **Hypothesis:** Species diversity declines with the size of the forest fragment.

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The Process of Science: How Does Tropical Forest Fragmentation Affect Biodiversity?

- **Prediction:** Predators will only be found in the largest areas.
- **Results:** Fragmentation of forests into smaller pieces does lead to a decline in species diversity.

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The Goal of Sustainable Development

- As the world population grows and becomes more affluent, the demand increases for the provisioning services of ecosystems, such as
 - food,
 - wood, and
 - water.

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The Goal of Sustainable Development

- The goal of **sustainable development** is to acquire the ecological information necessary for the responsible
 - development,
 - management, and
 - conservation of Earth's resources.



The Goal of Sustainable Development

- Sustainable development depends on
 - continued research,
 - the application of ecological knowledge, and
 - the connection of the life sciences with
 - social sciences,
 - economics, and
 - humanities.

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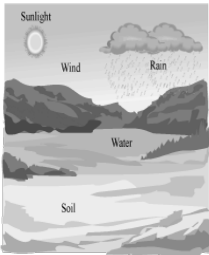
A Hierarchy of Interactions

- Many different factors can potentially affect an organism's interaction with the environment.
 - **Biotic factors** are
 - all of the organisms in the area and
 - the living component of the environment.
 - **Abiotic factors**
 - are the environment's nonliving component and
 - include chemical and physical factors, such as temperature, light, water, minerals, and air.

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Key Abiotic Factors in Ecology

- Energy
- Temp:
 - Temperature affects metabolism.
 - Few organisms can maintain a sufficiently active metabolism at temperatures close to 0°C
 - Temperatures above 45°C destroy the enzymes of most organisms.
- Water
- Nutrients:
 - In many aquatic ecosystems, the growth of algae and photosynthetic bacteria is often limited by levels of
 - nitrogen and
 - Phosphorus.
- Aquatic Features (dissolved oxygen, salinity, currents, and tides.)
- Terrestrial Features (wind, storms, or fire.)



Abiotic Energy

- Solar
- Thermal


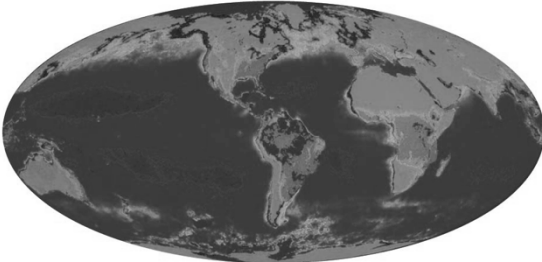


Figure 18.5

Figure 18.5 Distribution of life in the biosphere

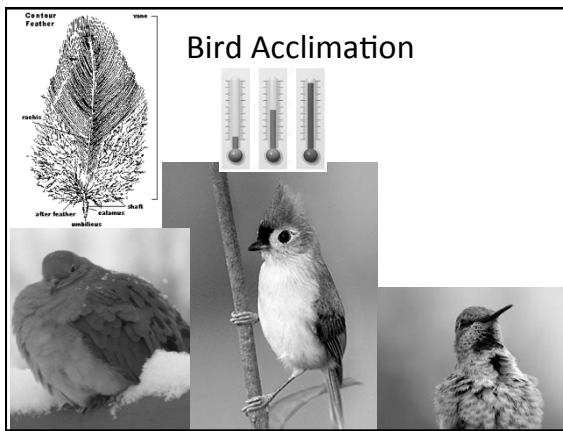


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Physiological Response from Biotic Factors

- Organisms need to respond to their environment
 - Genetic Variation = Pool they can pull from
 - RESPOND to world around them
- **Physiological Response:** Environmental variation can irreversibly affect
 - growth and
 - Development.
- Acclimation:
 - gradual,
 - reversible, and
 - a physiological adjustment to an environmental change.





Anatomical Response from Biotic Factors

- Organisms need to respond to their environment
- **Anatomical Response** – Some kind of Body change

Figure 18.13 Wind as an abiotic factor that shapes trees. The mechanical disturbance of the prevailing wind hinders limb growth on the windward side of this fir tree near the timberline in the Rocky Mountains, while limbs on the other side grow normally. This anatomical response is an evolutionary adaptation that reduces the number of limbs that are broken during strong winds.



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Behavioral Response from Biotic Factors

- Organisms need to respond to their environment
- **Behavioral Response:** In contrast to plants, most animals can respond to an unfavorable change in the environment by moving to a new location.
 - Ectotherms may shuttle between sun and shade.
 - Migratory birds travel great distances in response to changing seasons.
 - Humans have an especially rich range of behavioral responses.



**Biology and Society:
Penguins and Polar Bears in Peril**

- The scientific debate is over.
- The great majority of scientists now agree that the global climate is changing.
- Average global temperatures have risen 0.8°C (about 1.4°F) over the past century, mostly over the last 30 years.

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**Biology and Society:
Penguins and Polar Bears in Peril**

- Precipitation patterns have also changed, bringing
 - longer and more intense drought to some regions and
 - flooding to other areas.

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**Biology and Society:
Penguins and Polar Bears in Peril**

- Overwhelming evidence indicates that human enterprises are responsible for the changes that are occurring.
- Our response to this crisis will determine whether circumstances improve or worsen.

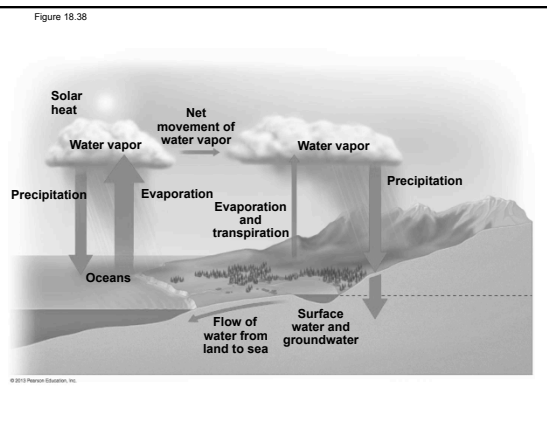
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The Water Cycle

- All parts of the biosphere are linked by the global water cycle.
- Human activities that affect the global water cycle include
 - destruction of forests and
 - pumping large amounts of groundwater to the surface for irrigation.

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Figure 18.38



BIOMES

– A **biome** is

- a major terrestrial or aquatic life zone,
- characterized by
 - vegetation type in terrestrial biomes or
 - the physical environment in aquatic biomes.

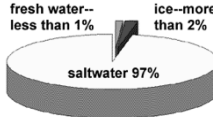


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BIOMES

– Aquatic biomes

- occupy roughly 75% of Earth's surface and
- are determined by their
 - salinity and
 - other physical factors.



– Freshwater biomes

- have a salt concentration of less than 1% and
- include lakes, streams, rivers, and wetlands.

– Marine biomes

- typically have a salt concentration around 3% and
- include oceans, intertidal zones, coral reefs, and estuaries.

Freshwater Biomes

– Freshwater biomes

- cover less than 1% of Earth,
- contain a mere 0.01% of its water,
- harbor about 6% of all described species, and
- are used for
 - drinking water,
 - crop irrigation,
 - sanitation, and
 - industry.

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Freshwater Biomes

– Freshwater biomes fall into two broad groups:

- 1. **Lentic:** standing water, which includes lakes and ponds, and
- 2. **Lotic:** flowing water, such as rivers and streams.



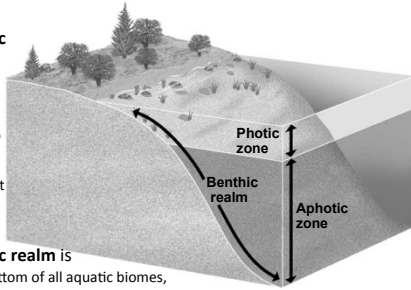
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– The **photic zone**, named because light is available for photosynthesis, includes

- the shallow water near shore and
- the upper layer of water away from shore.

– The **aphotic zone**

- is deeper and
- has light levels too low to support photosynthesis.



– The **benthic realm** is

- at the bottom of all aquatic biomes,
- made up of sand and organic and inorganic sediments, and
- occupied by communities of organisms that are collectively called benthos.

Wetlands

– A **wetland** is a transitional biome between

- an aquatic ecosystem and
- a terrestrial one.


– Wetlands

- support the growth of aquatic plants and
- are rich in species diversity.

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Marine Biomes

- Marine biomes are diverse, ranging from vivid coral reefs to perpetually dark realms in the deepest regions.
- As in freshwater biomes, the seafloor is known as the benthic realm.
- The **pelagic realm** includes all of the open water of the oceans.

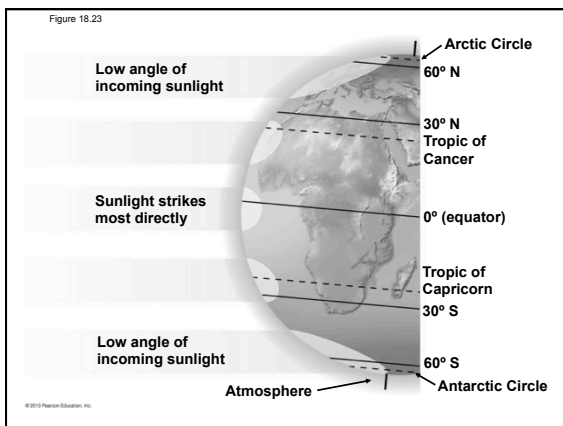


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How Climate Affects Terrestrial Biome Distribution

- Terrestrial biomes are primarily determined by climate, especially
 - temperature and
 - rainfall.
- Earth’s global climate patterns are largely the result of
 - the input of radiant energy from the sun and
 - the planet’s movement in space.

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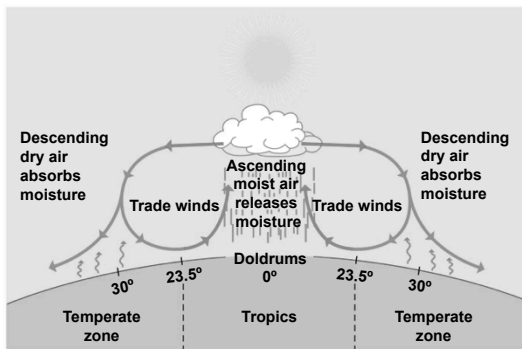


How Climate Affects Terrestrial Biome Distribution

- Heated by the direct rays of the sun, air at the equator
 - rises,
 - then cools, forming clouds, and
 - drops rain.
- This largely explains why rain forests are concentrated in the **tropics**, the region from the Tropic of Cancer to the Tropic of Capricorn.

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Figure 18.24



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How Climate Affects Terrestrial Biome Distribution

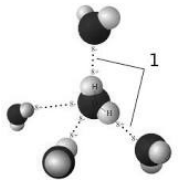

- **Temperate zones** generally have milder climates than the tropics or the polar regions. They occur in latitudes between
 - the tropics and the Arctic Circle in the north and
 - the tropics and the Antarctic Circle in the south.

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How Climate Affects Terrestrial Biome Distribution

– Climate is also affected by

- proximity to large bodies of water and
- the presence of landforms such as mountain ranges.

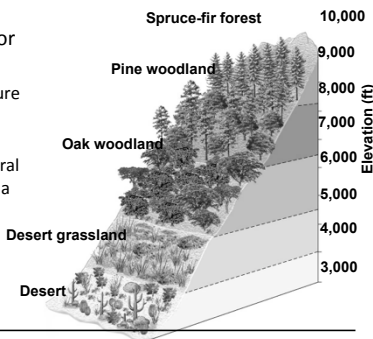



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How Climate Affects Terrestrial Biome Distribution

– Mountains affect climate in two major ways.

- First, air temperature drops as elevation increases.
- This results in several biomes moving up a tall mountain.

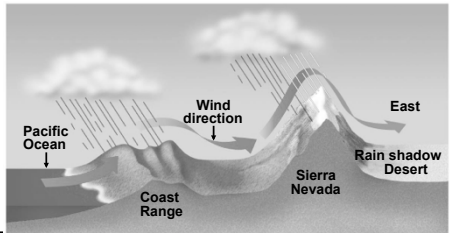


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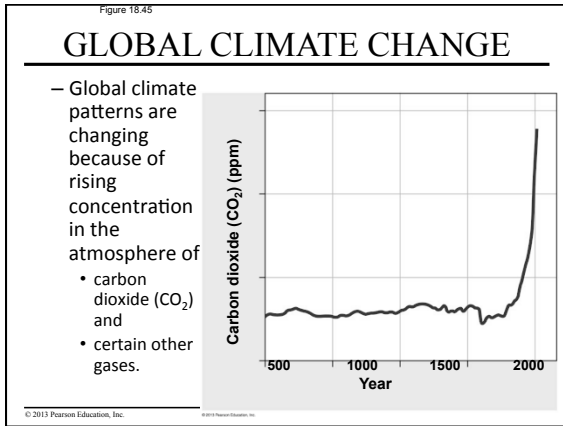
How Climate Affects Terrestrial Biome Distribution

- Second, mountains can
 - block the flow of cool, moist air from a coast and
 - cause radically different climates on opposite sides of a mountain range.

Figure 18.26



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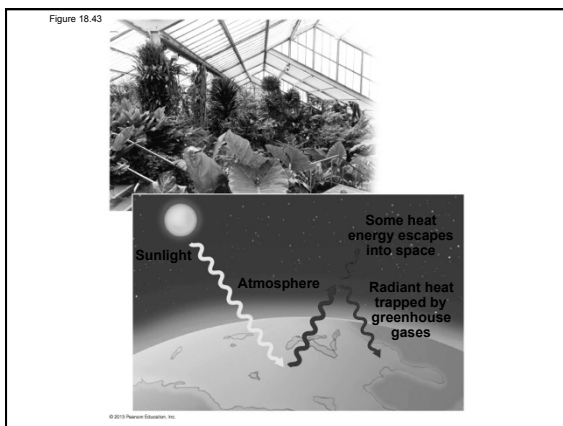
The Greenhouse Effect and Global Warming

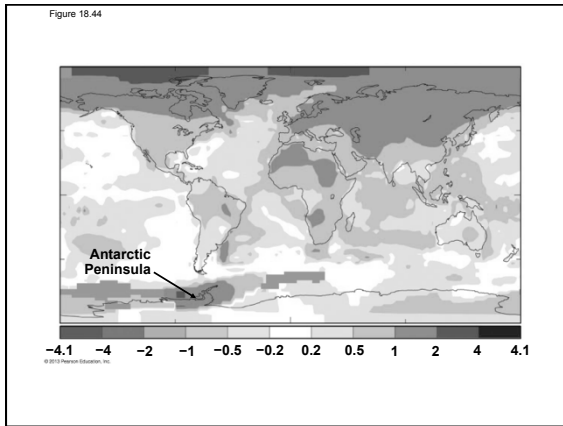
– **Greenhouse gases**

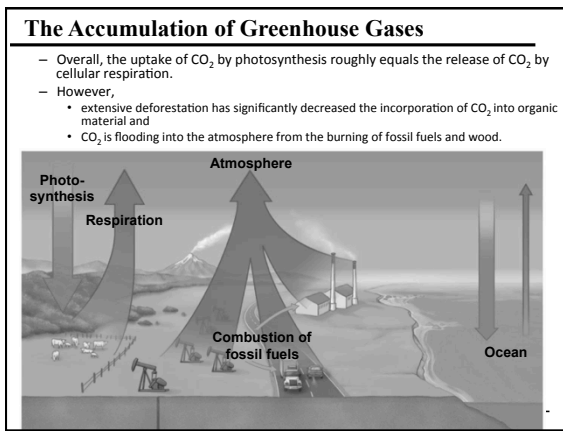
- include CO₂, water vapor, and methane,
- are transparent to solar radiation,
- absorb or reflect heat, and
- contribute to increases in global temperatures in what is often called the **greenhouse effect**.

PLAY Blast Animation: The Greenhouse Effect

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Effects of Climate Change on Ecosystems

- In many plants and animals, life cycle events are triggered by
 - warming temperatures or
 - day length.
- As global temperatures warm, and day length remains steady, natural interactions may become out of sync.
 - The winter white fur of snowshoe hares may be conspicuous against a greening landscape.
 - Plants may bloom before pollinators have emerged.

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