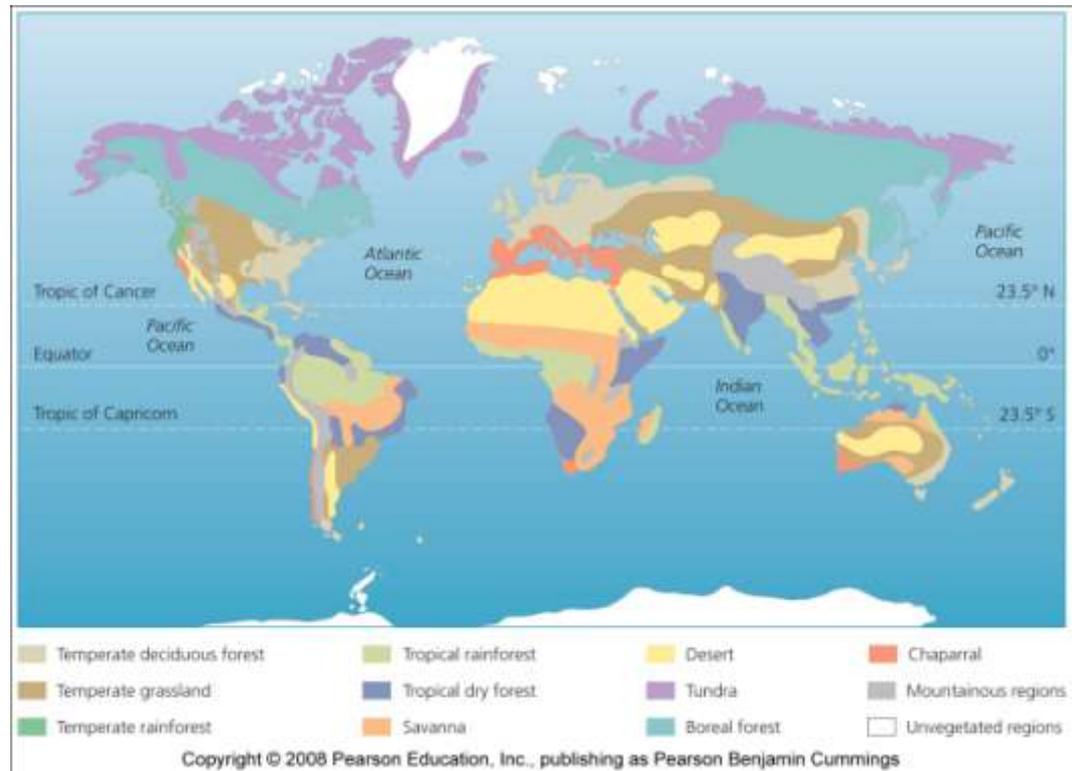


How climate effects who lives
where.

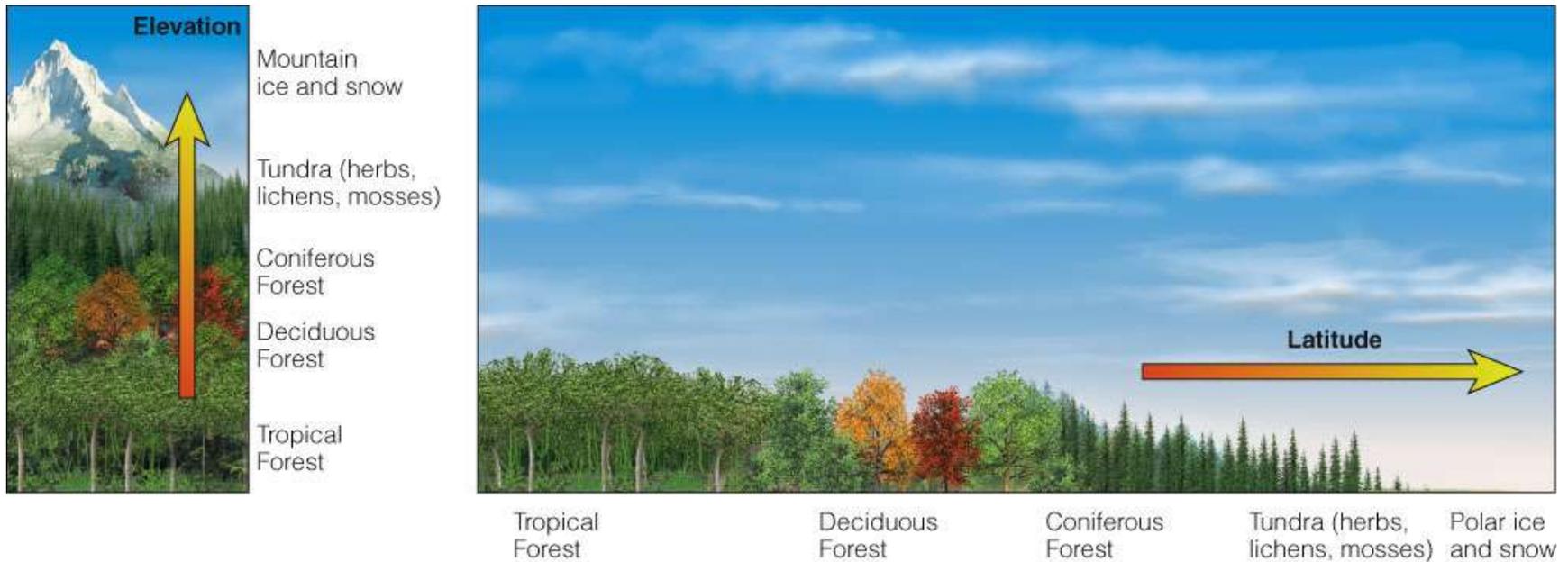
The World's Terrestrial Biomes

Widely separated regions share similarities

- Biome = major regional complex of similar communities recognized by
 - Plant type
 - Vegetation structure



BIOMES: CLIMATE AND LIFE ON LAND

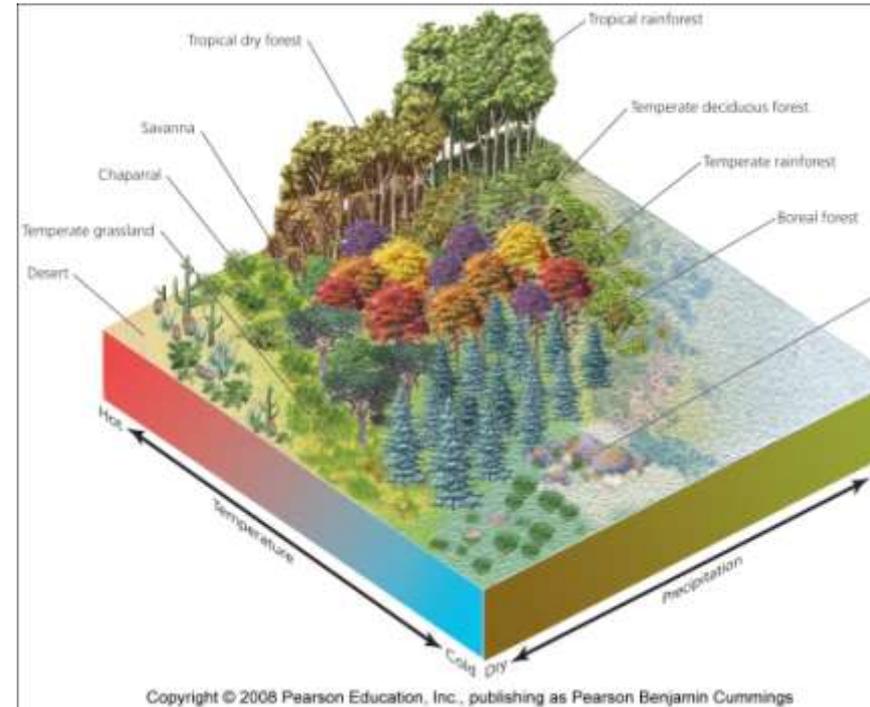


© 2007 Thomson Higher Education

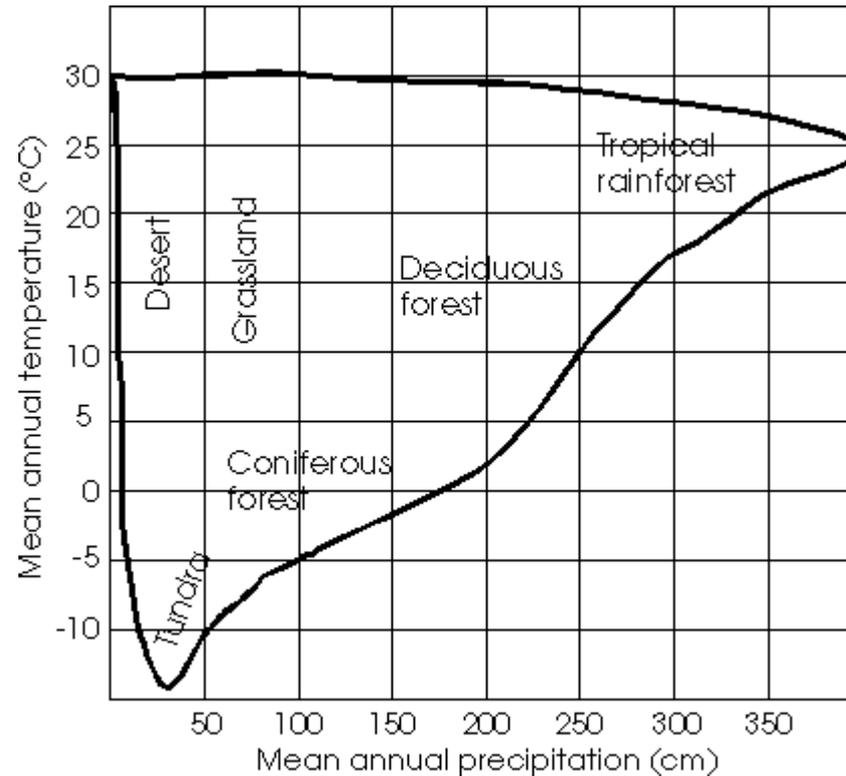
- Parallel changes occur in vegetation type occur when we travel from the equator to the poles or from lowlands to mountaintops.

A variety of factors determine the biome

- The biome in an area depends on a variety of abiotic factors
 - Temperature, precipitation, atmospheric circulation, soil
- Climatographs
 - A climate diagram showing an area's mean monthly temperature and precipitation
 - Similar biomes occupy similar latitudes



Biomes are determined by climate

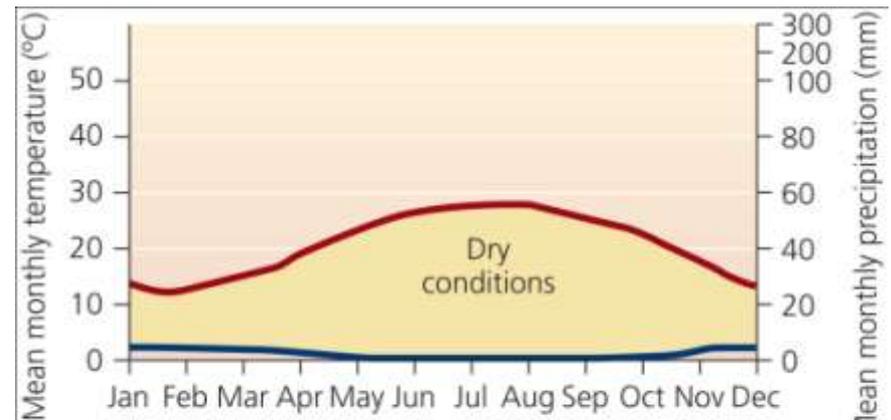


DESERT BIOMES

- Deserts are areas where evaporation exceeds precipitation.
- Deserts have little precipitation and little vegetation.
 - Found in tropical, temperate and polar regions.
 - 30% of land masses
 - Interior continent
- Desert plants have adaptations that help them stay cool and get enough water.

Desert

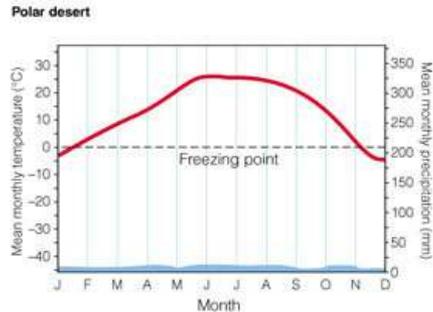
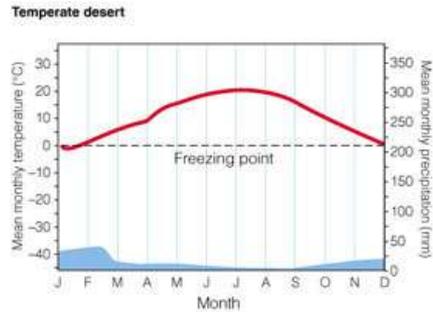
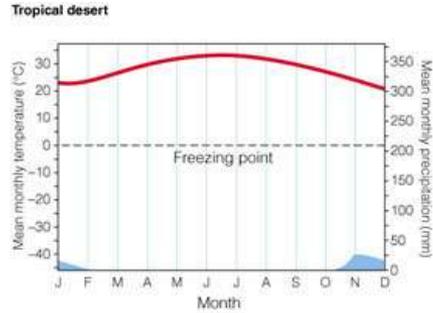
- Minimal precipitation
- Some deserts are bare, with sand dunes (Sahara) and some deserts are heavily vegetated (Sonoran)
- They are not always hot, temperatures vary widely
- Nocturnal or nomadic animals
- Plants have thick skins or spines
- Saline soil



Adaptations

- Two main survival tools
 - Beat the heat and water conservation
 - Succulent plants have no leaves, store water and make food in the “fleshy” sections, only open stoma at night to respire
 - Deep roots or many shallow roots
 - Animals hide during the daytime
 - Insects have hard exoskeleton

DESERT BIOMES



- Variations in annual temperature (red) and precipitation (blue) in tropical, temperate and cold deserts.

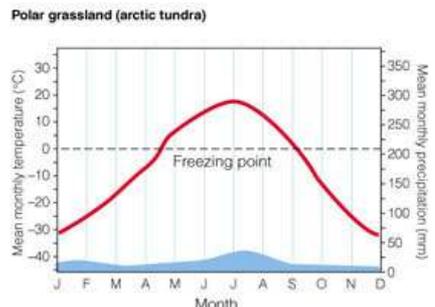
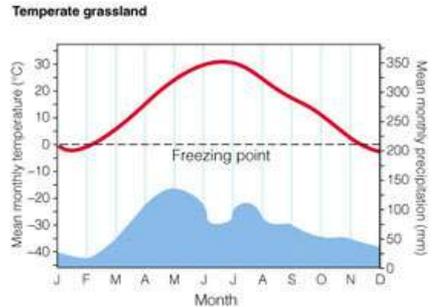
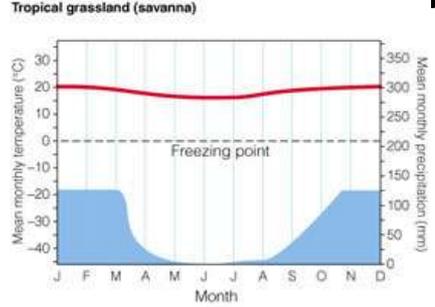
Figure 5-12

GRASSLANDS AND CHAPARRAL BIOMES

- Grasslands (prairies) occur in areas too moist for desert and too dry for forests.
 - Interior continents
- Savannas are tropical grasslands with scattered tree and herds of hoofed animals.

GRASSLANDS AND CHAPARRAI BIOMES

- Variations in annual temperature (red) and precipitation (blue).

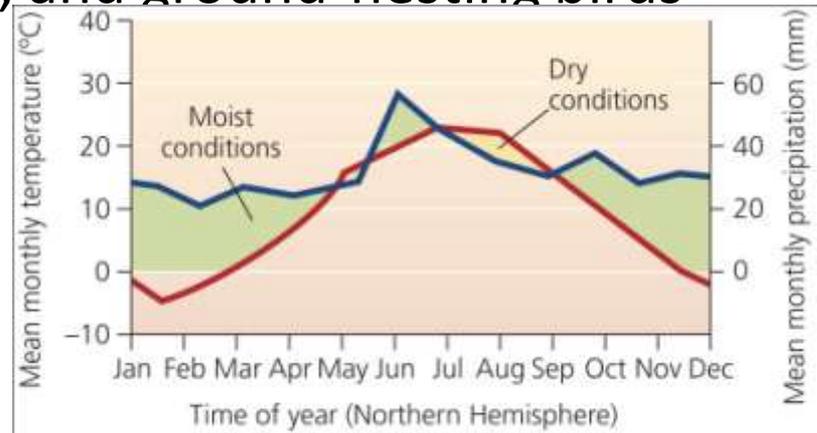


© 2007 Thomson Higher Education

Figure 5-14

Temperate grasslands

- More extreme temperature difference between winter and summer
- Less precipitation
- Also called **steppe** or **prairie**
 - Once widespread throughout parts of North and South America and much of central Asia
 - Much was converted for agriculture
 - Bison, prairie dogs, antelope, and ground-nesting birds

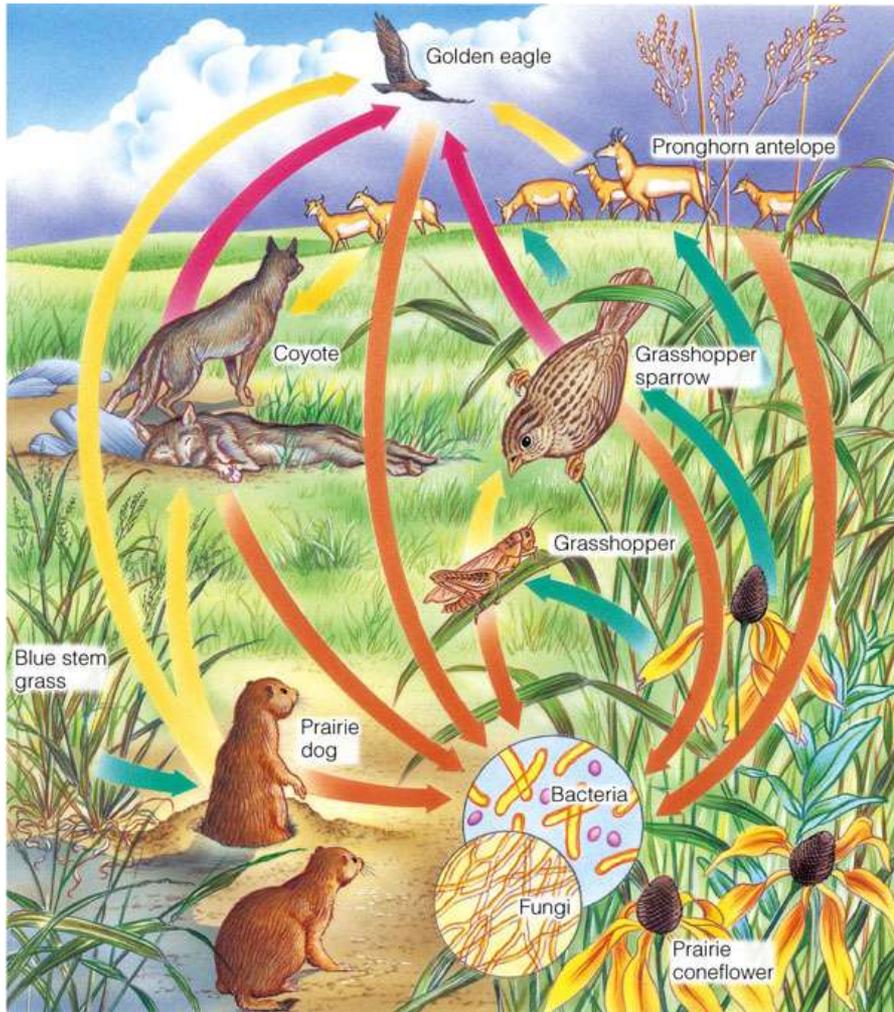


Temperate Grasslands



- The cold winters and hot dry summers have deep and fertile soil that make them ideal for growing crops and grazing cattle.
 - Fertile soil because of vegetation → decay → nutrients

Temperate Grasslands



- Temperate tall-grass prairie ecosystem in North America.
 - Thick root systems hold soil
 - Short and long grasses

➔ Producer to primary consumer ➔ Primary to secondary consumer ➔ Secondary to higher-level consumer ➔ All producers and consumers to decomposers

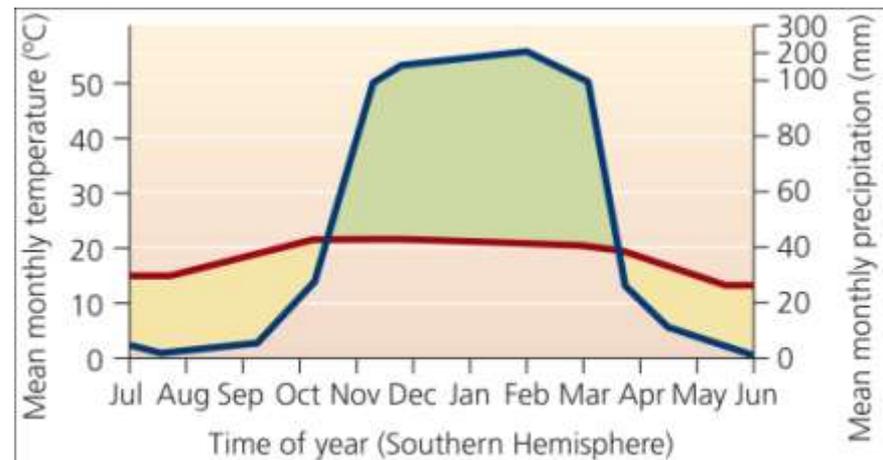
Savanna

- Grassland interspersed with trees
- Africa, South America, Australia, India
- Precipitation only during rainy season
- Water holes



(a) Savanna

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

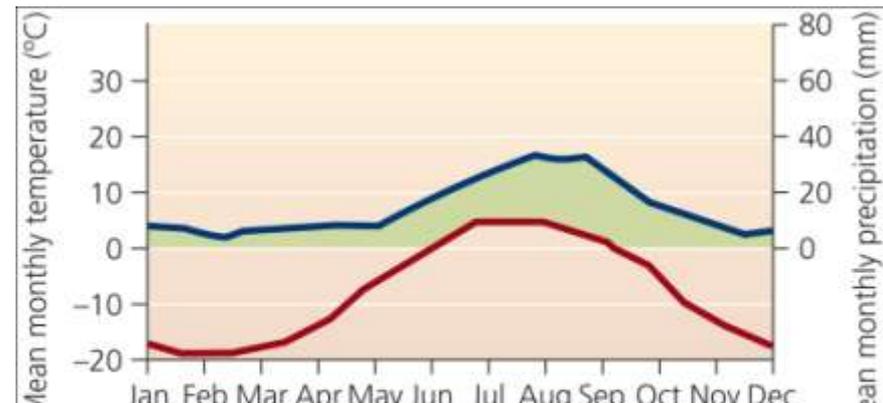


(b) Harare, Zimbabwe

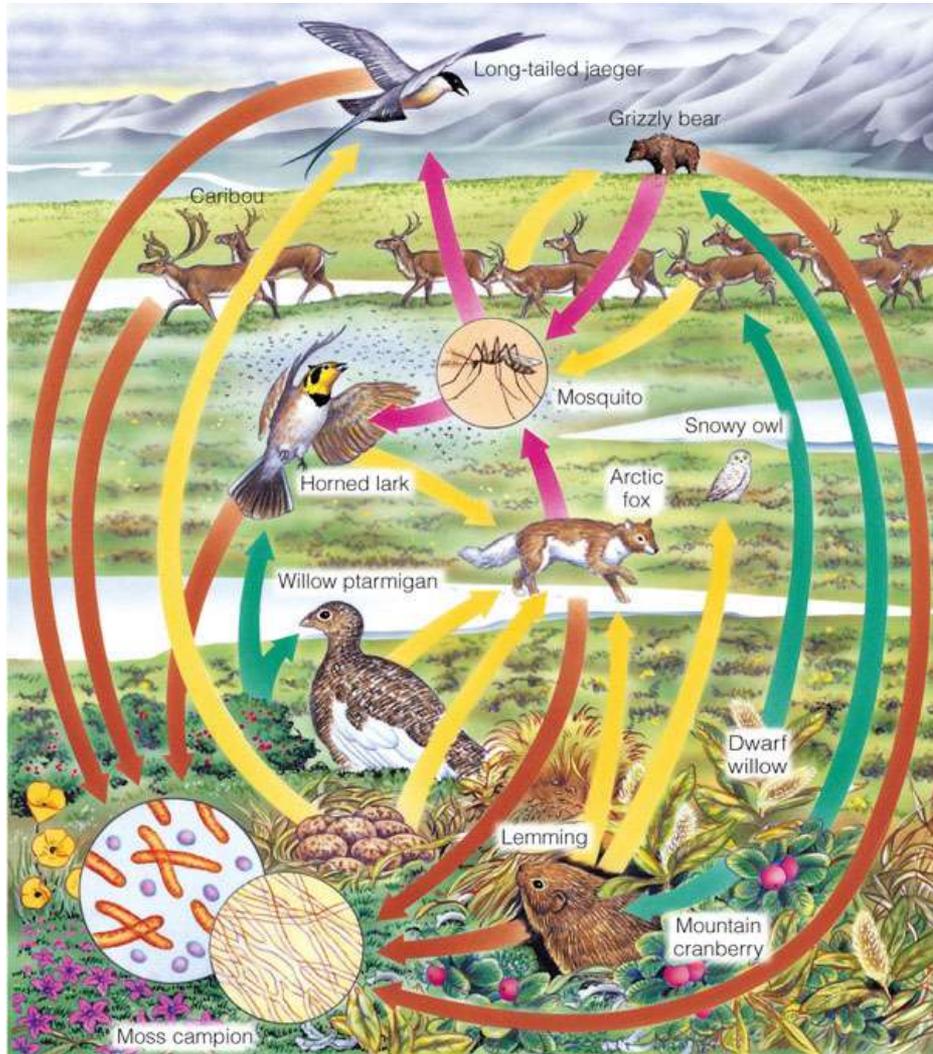
Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Tundra

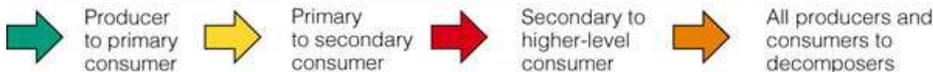
- Canada, Scandinavia, Russia
- Minimal precipitation
 - Nearly as dry as a desert
- Seasonal variation in temperature
 - Extremely cold winters
- Permafrost: permanently frozen soil
- Few animals: polar bears, musk oxen, caribou
- Lichens and low vegetation with few trees



Polar Grasslands



- Polar grasslands are covered with ice and snow except during a brief summer.
 - Summer sun causes bogs and wetlands
 - Insects thrive in marshy areas
 - Birds thrive on insects
 - Animals have thick coats



Chaparral



- Chaparral has a moderate climate but its dense thickets of spiny shrubs are subject to periodic fires.
 - Coastal areas, border deserts
 - Long rainy winters, warm dry summers

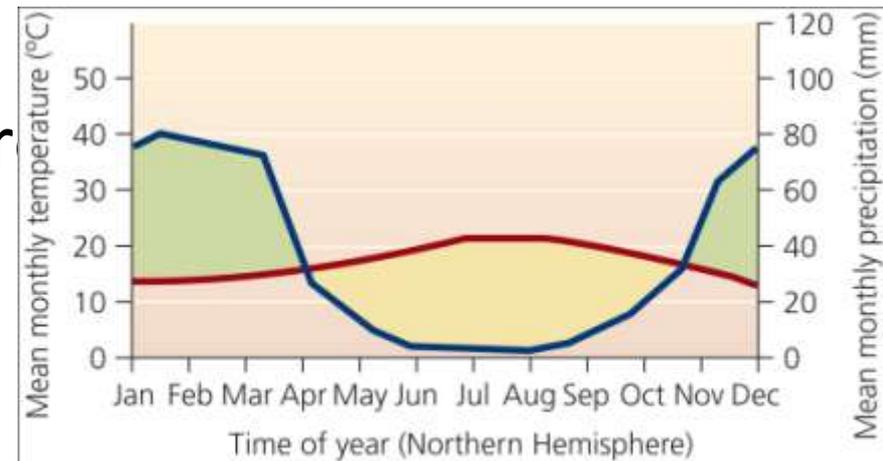
Chaparral

- Mediterranean Sea, California, Chile, and southern Australia
- High seasonal
 - Mild, wet winters
 - Warm, dry summers
- Frequent fires
- Densely thicketed, evergreen shrubs



(a) Chaparral

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings



(b) Los Angeles, California, USA

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Adaptations

- Drought and fires keep these biomes grassy

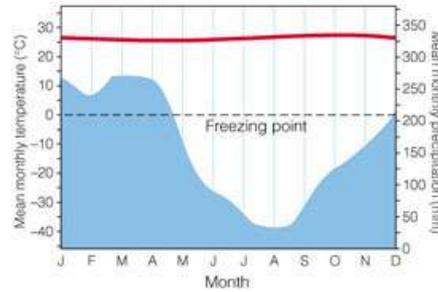
FOREST BIOMES

- Forests have enough precipitation to support stands of trees and are found in tropical, temperate, and polar regions.

FOREST BIOMES



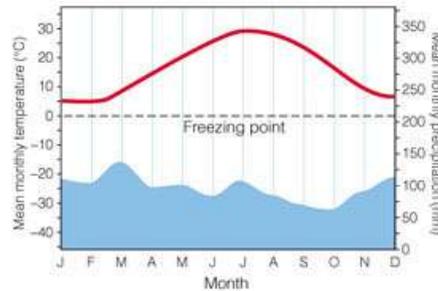
Tropical rain forest



- Variations in annual temperature (red) and precipitation (blue) in tropical, temperate, and polar forests.



Temperate deciduous forest



Polar evergreen coniferous forest (boreal forest, taiga)

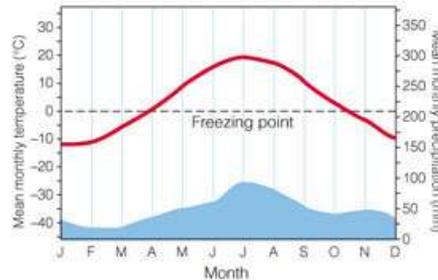
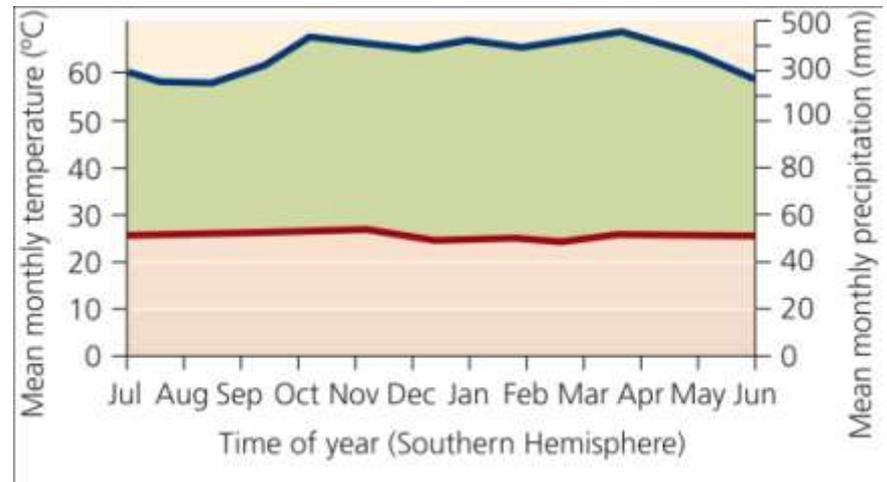


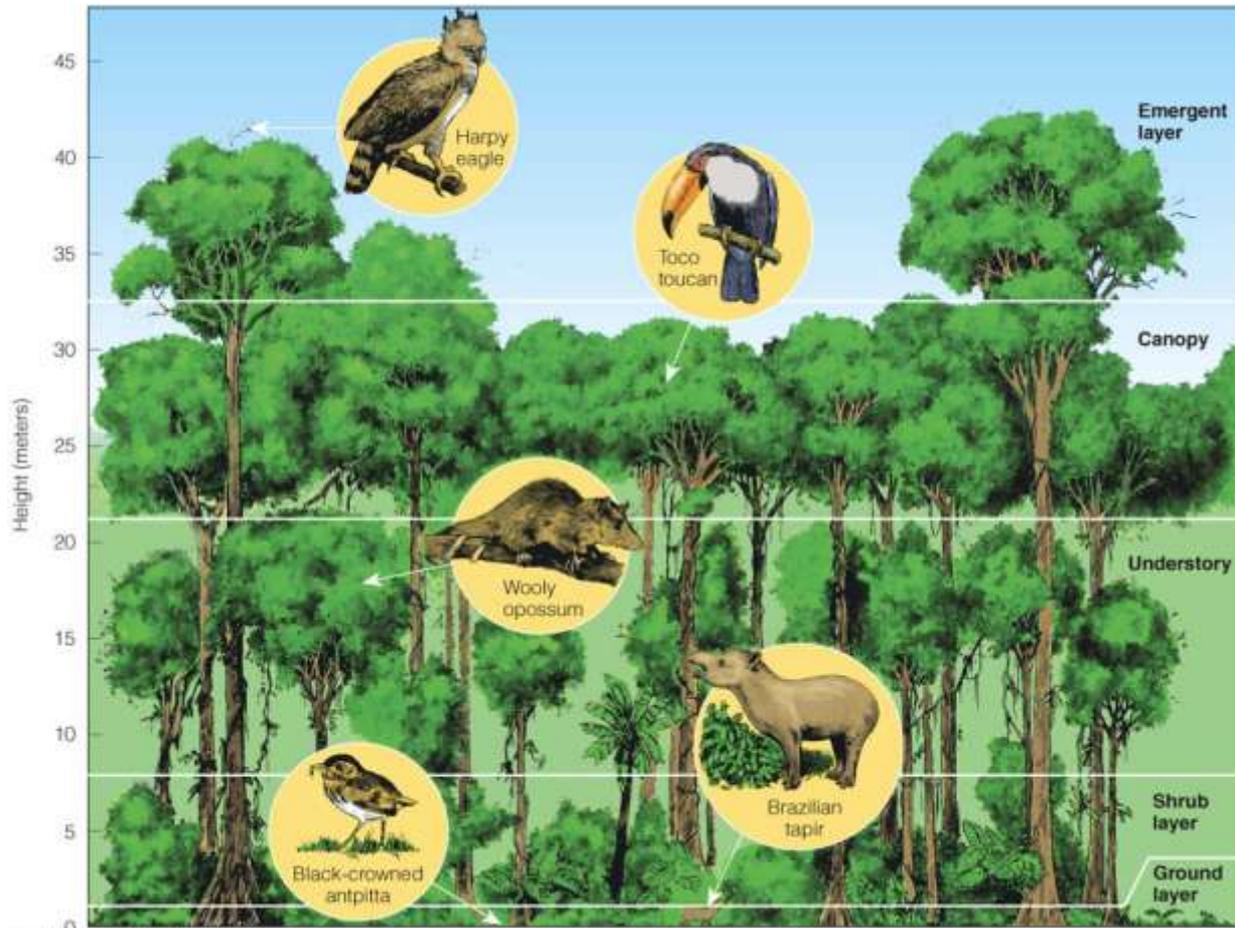
Figure 5-19

Tropical rainforest

- Central America, South America, southeast Asia, and west Africa
- Year-round rain and warm temperatures
- Dark and damp
- Lush vegetation
- Variety of animals and tree species, but in low numbers
- Very poor, acidic soils



Tropical Rain Forest



- Filling such niches enables species to avoid or minimize competition and coexist

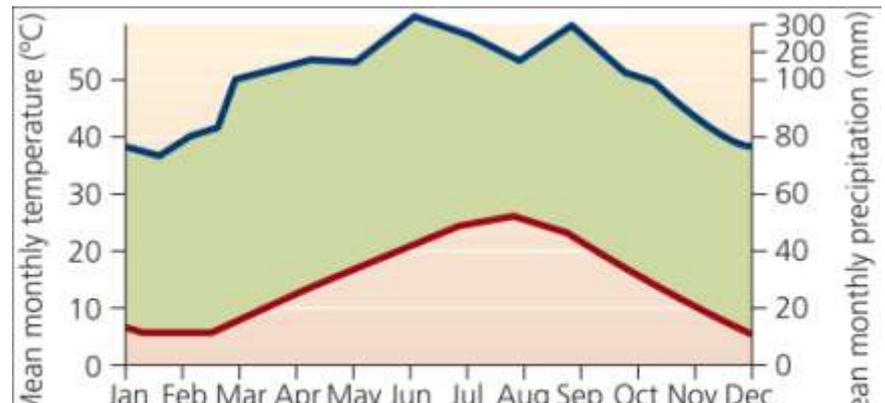
Figure 5-21

Flora & Fauna

- Flora: broadleaf evergreens with wide bases and shallow roots
 - Canopy is where most of the flora is; block sun, therefore very few plants on the forest floor
 - Canopy is the residence of most fauna
 - Little wind for seed dispersal so plants and animals rely on bats, birds and other flying insects
- Soil is not very nutrient rich

Temperate rainforest

- Coastal Pacific Northwest region
- Great deal of precipitation
- Coniferous trees: cedar, spruce, hemlock, fir
- Moisture-loving animals
 - Banana slug
- The fertile soil is susceptible to erosion and landslides
- Provides lumber and paper



Temperate Rain Forests



- Coastal areas support large, old, bearing evergreen trees such as redwoods and Douglas fir in a cool moist environment.
 - Why do we find them on the west coast?

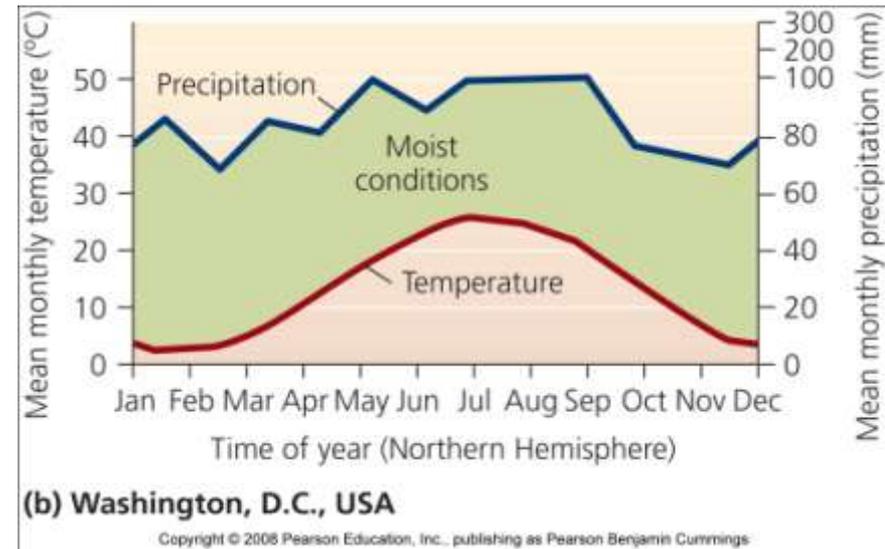
Tropical dry forest

- Tropical deciduous forest
- India, Africa, South America, northern Australia
- Wet and dry seasons
- Warm, but less rainfall
- Converted to agriculture
- Erosion-prone soil



Temperate deciduous forest

- **Deciduous trees** lose their leaves each fall and remain dormant during winter
- Mid-latitude forests in Europe, East China, Eastern North America
- Fertile soils
- Forests = oak, beech, maple



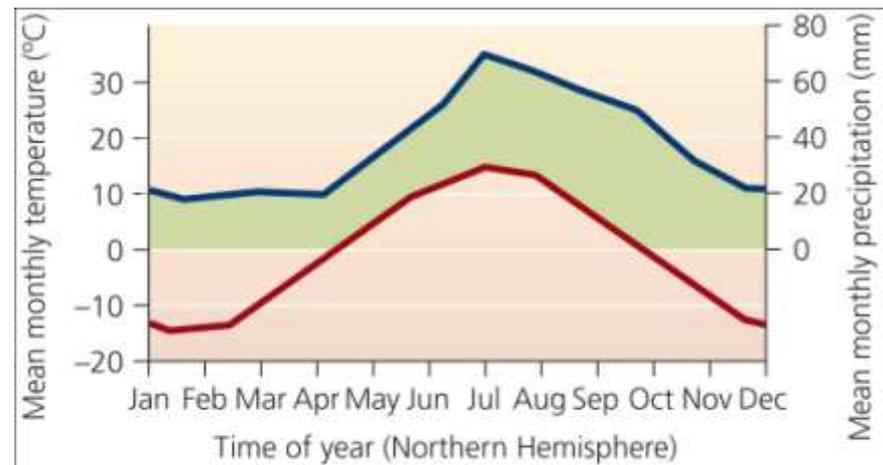
Boreal forest (taiga)

- Canada, Alaska, Russia, Scandinavia
- Variation in temperature and precipitation
- Cool and dry climate
 - Long, cold winters
 - Short, cool summers
- Poor and acidic soil
- Few evergreen tree species
- Moose, wolves, bears, migratory birds



(a) Boreal forest

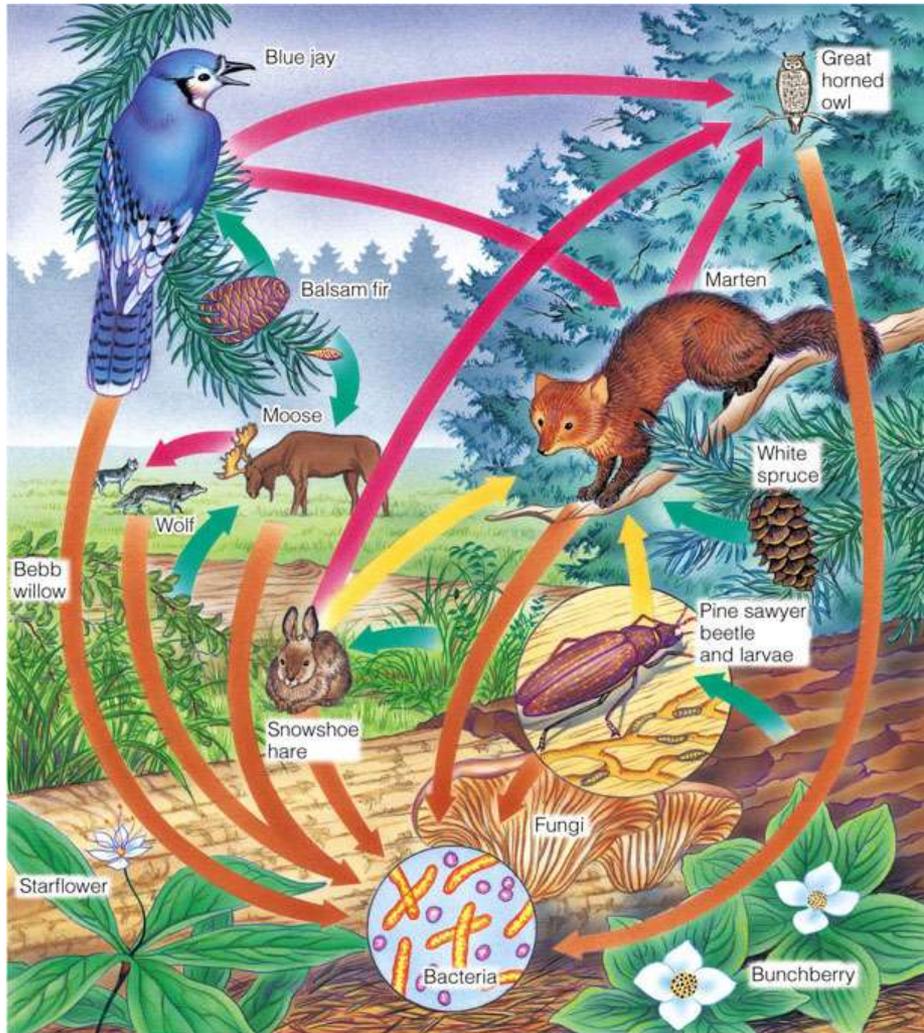
Copyright © 2006 Pearson Education, Inc., publishing as Pearson Benjamin Cummings



(b) Archangelsk, Russia

Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

Evergreen Coniferous Forests

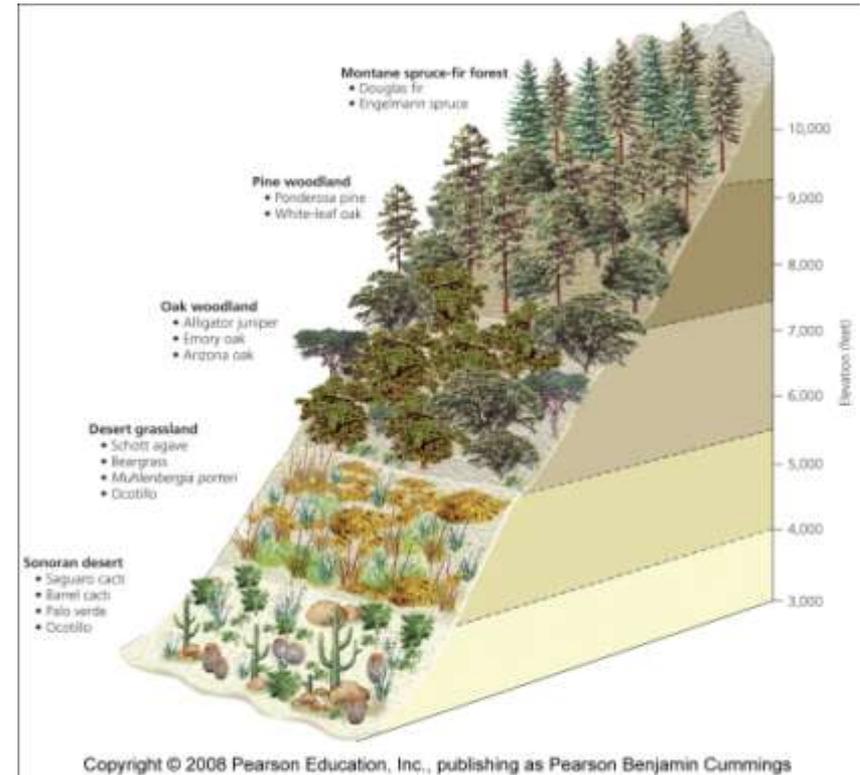


- Consist mostly of cone-bearing evergreen trees that keep their needles year-round to help the trees survive long and cold winters.
 - Boreal or taiga

➔ Producer to primary consumer
 ➔ Primary to secondary consumer
 ➔ Secondary to higher-level consumer
 ➔ All producers and consumers to decomposers

Altitudes create patterns

- Vegetative communities change along mountain slopes
 - In the Andes, a mountain climber would begin in the tropics and end up in a glacier



Mountain Biomes

- Mountains are high elevation islands of biodiversity.
 - They often have snow covered peaks that reflect solar radiation and gradually release water to lower elevation streams and ecosystems.

MOUNTAIN BIOMES



- High-elevation islands of biodiversity
- Often have snow-covered peaks that reflect solar radiation and gradually release water to lower-elevation streams and ecosystems.

Resources

- 75% of all our fresh water is stored in snow and ice on mountain tops and slowly released into streams
- Mountains block wind
- Snow reflects light back into the atmosphere

Summary of Terrestrial Biomes

| | | | |
|--|--|--|--|
| | | | |
| | | | |
| | | | |
| | | | |

Man's Impact on the Biomes

Human Activities have harmed the Earth's natural balance.

- Human activities have damaged or disturbed more than half of the world's terrestrial ecosystems.
- Human's have had a number of specific harmful effects on the world's deserts, grasslands, forests and mountains.

Human Impact

- Desert biomes have a very long recovery period
 - Lack of vegetation and water
 - You can still see footprints in the Mojave

Degradation of Deserts

- Man has
 - Built large desert cities.
 - Destroyed topsoil by offroad vehicles
 - Salinated the soil from irrigation
 - Depleted the groundwater supply
 - Disturbed land and polluted land from mineral extraction
 - *Desert biomes are the most vulnerable because they take the longest to replenish!

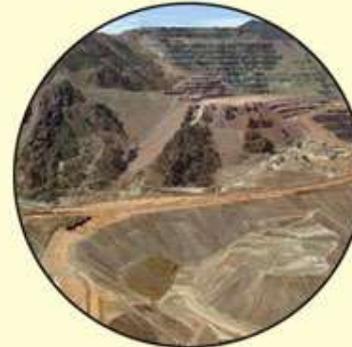
Natural Capital Degradation

Desert

Large desert cities



Soil destruction by off-road vehicles



Soil salinization from irrigation

Depletion of groundwater

Land disturbance and pollution from mineral extraction



Degradation of Grasslands

- Man has
 - converted grasslands to croplands (which is bad for a whole lot of reasons!!!)
 - released CO₂ into the atmosphere from the burning of grasslands
 - allowed for the overgrazing of herding livestock
 - disturbed land for oil production and transportation

Human Impact

- Because the soil is so fertile, we have converted temperate grasslands into farmlands
- Because of the desirable temperatures and aesthetic attraction of chaparrals, we have developed these biomes into communities

Natural Capital Degradation

Grasslands

Conversion to cropland

Release of CO₂ to atmosphere
from grassland burning

Overgrazing by livestock

Oil production and off-road
vehicles in arctic tundra



Degradation of the Forests

- Man has
 - cleared away forests for agriculture, livestock, grazing, timber and urban development
 - converted diverse forests to tree plantations
 - disturbed the land with offroad vehicles
 - polluted the forest streams

Impact

- Industrialization and urban sprawl have destroyed many of our primary forest growth
 - Look around you!

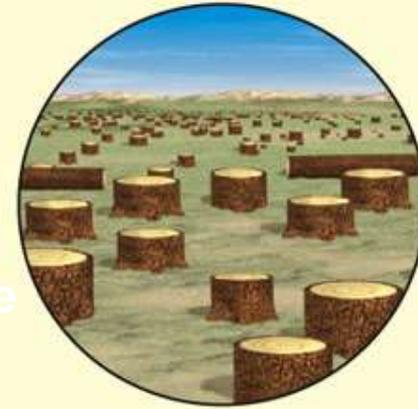
Impact

- Over 40% of the natural tropical rain forests have been cleared (now account for only 6% of the total land mass)
- 20% of our Oxygen comes from the rainforest
- 50% of all species on Earth can be found in the rainforest

Natural Capital Degradation

Forests

Clearing for agriculture, livestock grazing, timber, and urban development



Conversion of diverse forests to tree plantations

Damage from off-road vehicles

Pollution of forest streams



Natural Capital Degradation

Mountains

Agriculture

Timber extraction

Mineral extraction

Hydroelectric dams and reservoirs

Increasing tourism

Urban air pollution

Increased ultraviolet radiation from ozone depletion

Soil damage from off-road vehicles

