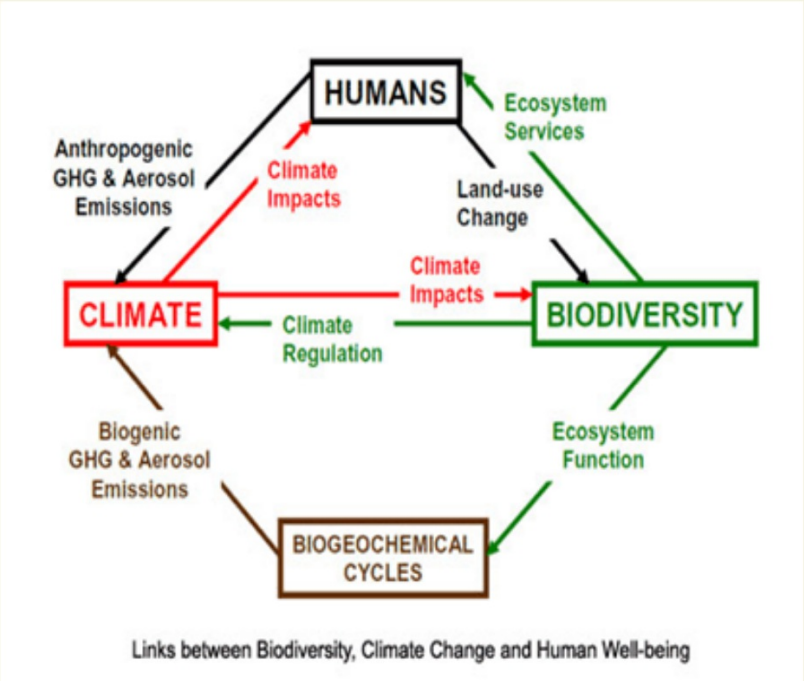
Chapter 7
Climate and Biodiversity

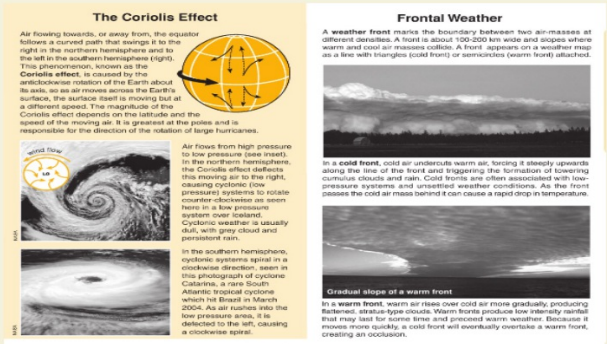


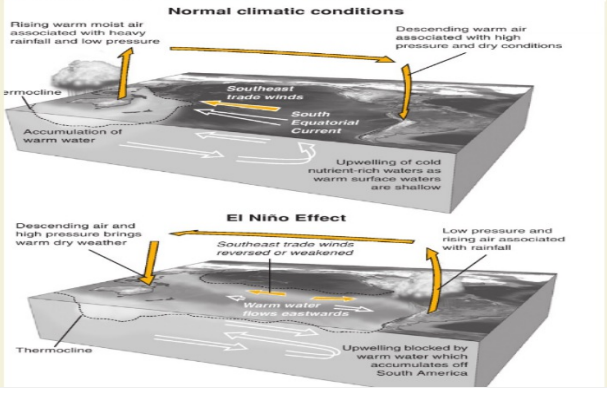
Links between Biodiversity, Climate Change and Human Well-being

To do science is to search for repeated patterns, not simply to accumulate facts, and to do the science of geographical ecology is to search for patterns of plant and animal life that can be put on a map.
- Robert H. MacArthur

Variation and Oscillation

Directions: Read the information and answer the questions in your composition book.





1. Explain the role of the Coriolis effect in the prevailing winds in different regions globe.
2. Draw schematic diagrams to show:
   a. The movement of a cold front into an of warm air.
   b. The movement of air in a Southern Hemisphere cyclone and a Northern Hemisphere hurricane.
3. Describe the events that cause El Nino conditions and its effects on ocean circu
4. Describe the effect on an El Nino on on:
   a. climate of the western coast of South America
   b. climate of Indonesia and Australia

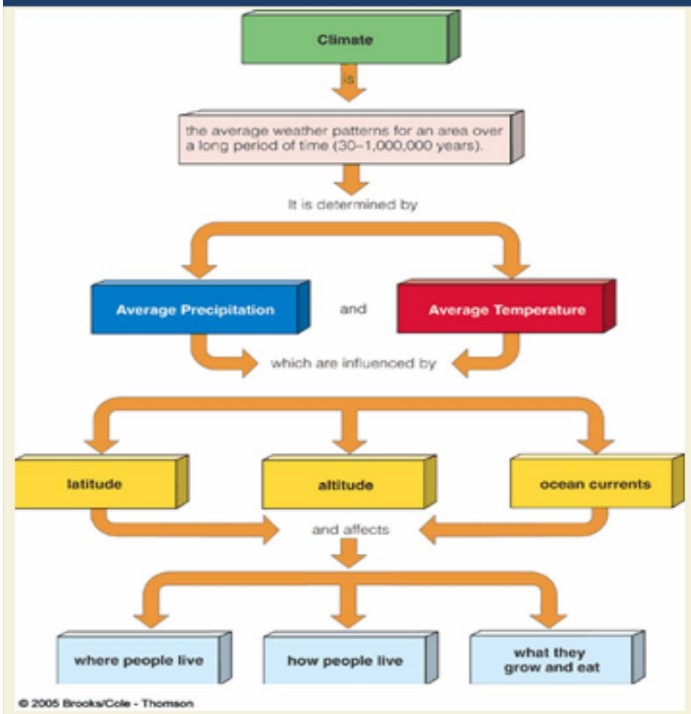
Core Case Study: Different Climates Support Different Life Forms

Climate -- long-term temperature and precipitation patterns – determines which plants and animals can live where

- Tropical: equator, intense sunlight
- Polar: poles, little sunlight

  Temperate: in-between tropical and polar

7-1 What Factors Influence Climate?



Concept 7-1 *Key factors that determine an area's climate are incoming solar energy, the earth's rotation, global patterns of air and water movement, gases in the atmosphere, and the earth's surface features.*

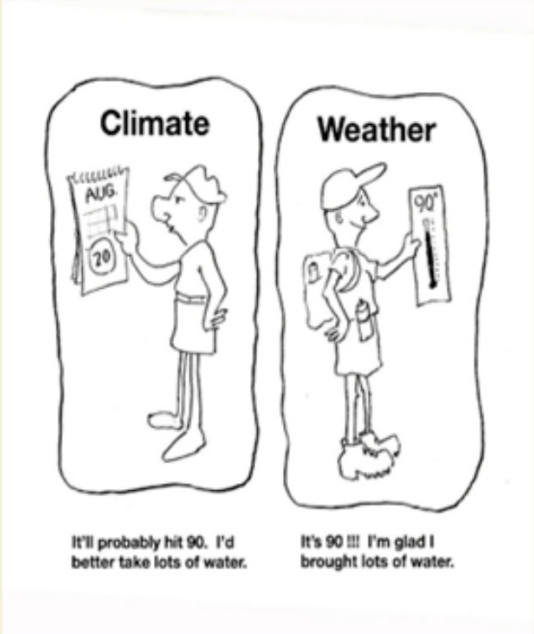
WEATHER VS. CLIMATE

Weather

- Temperature, precipitation, wind speed, cloud cover
- Hours to days

Climate

- Area's general pattern of atmospheric conditions over decades and longer



VIDEO: Introduction to Climate

Natural Capital: Generalized Map of the Earth's Current Climate Zones

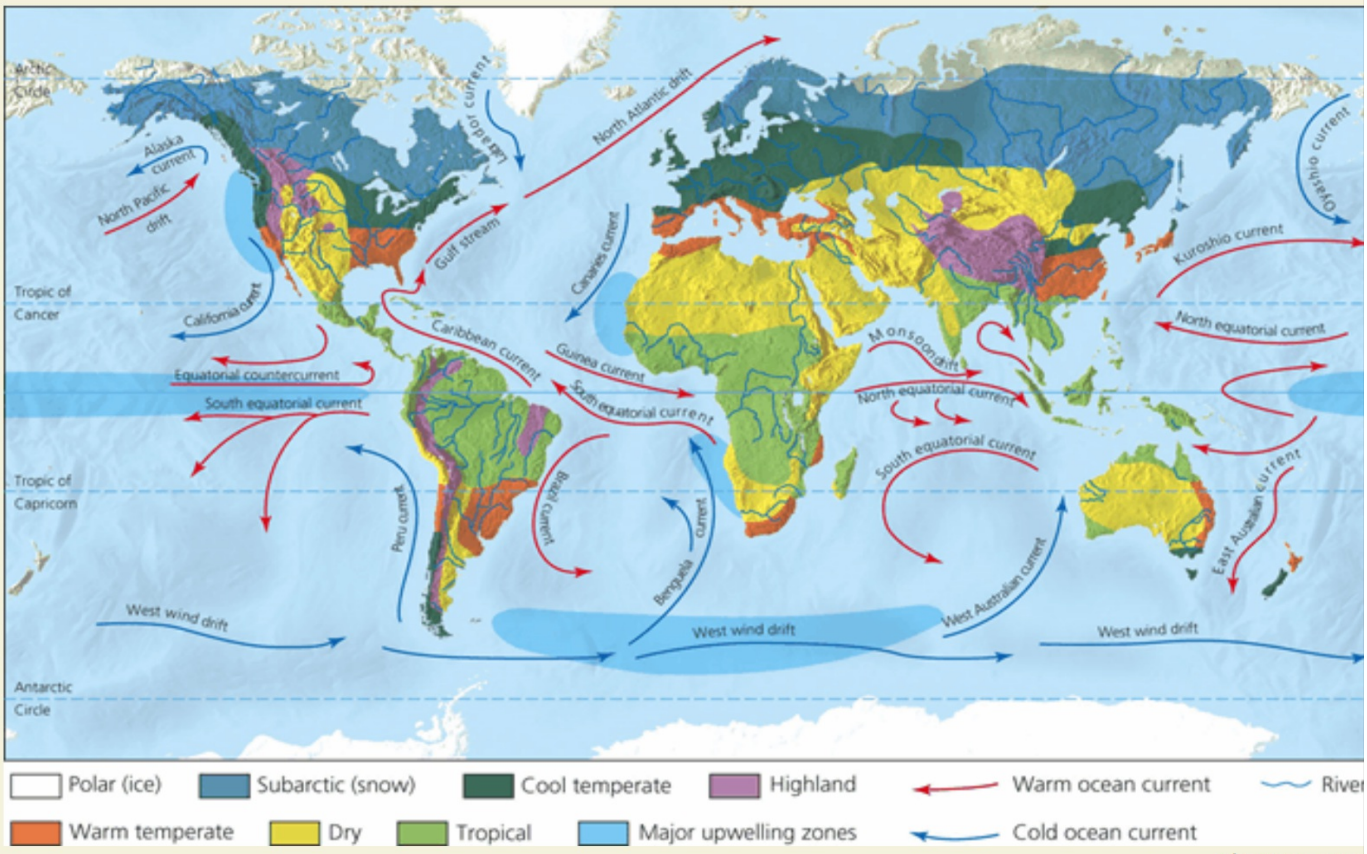


Fig. 7-2, p. 149

The Earth Has Many Different Climates

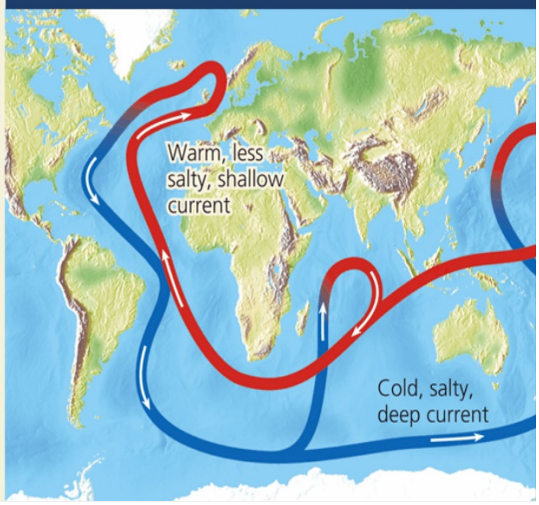
Air circulation in lower atmosphere due to

- Uneven heating of the earth's surface by sun
- Rotation of the earth on its axis
- Properties of air, water, and land

Ocean currents

- Prevailing winds
- Earth's rotation
- Redistribution of heat from the sun
- Surface currents and deep currents

Connected Deep and Shallow Ocean Currer



Global Air Circulation

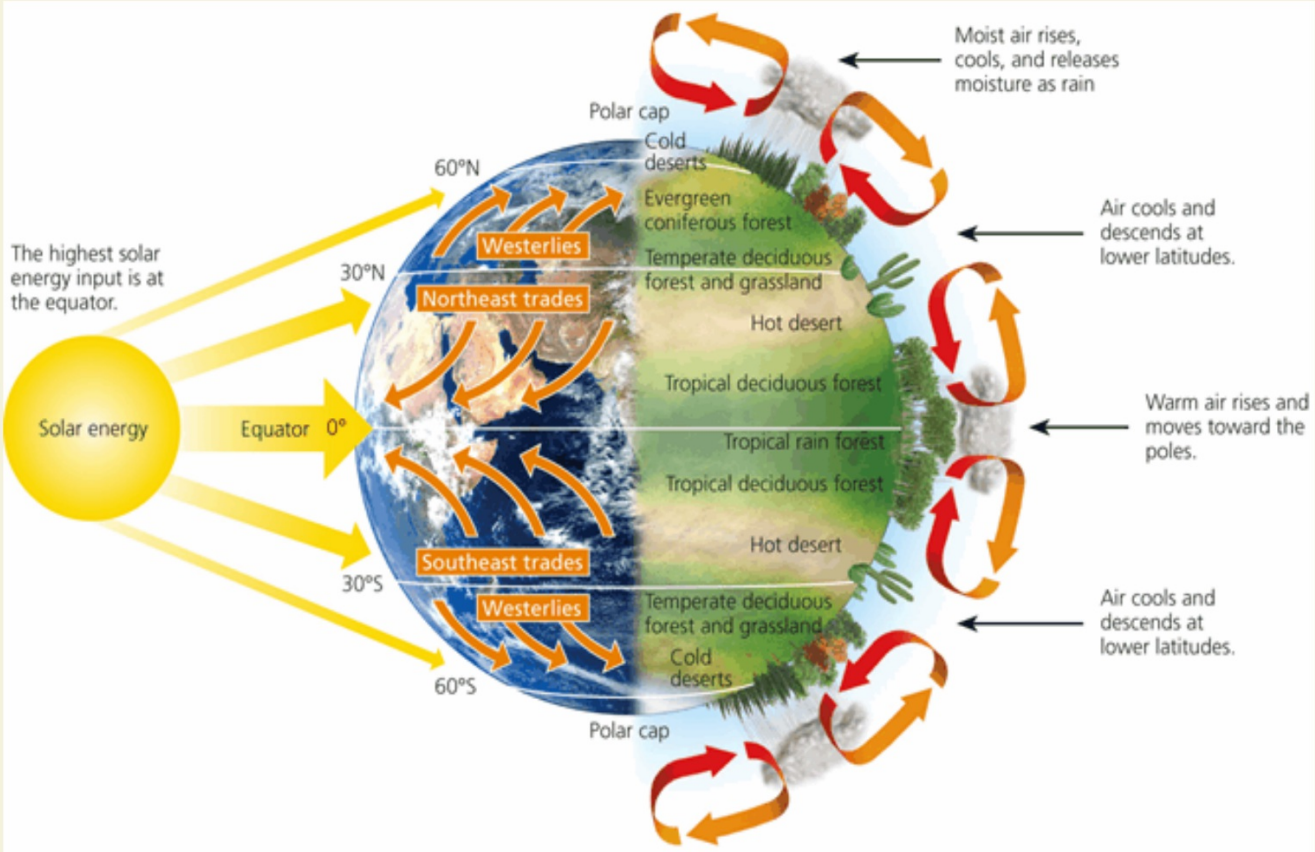


Fig. 7-3, p. 149

Energy Transfer by Convection in the Atmosphere

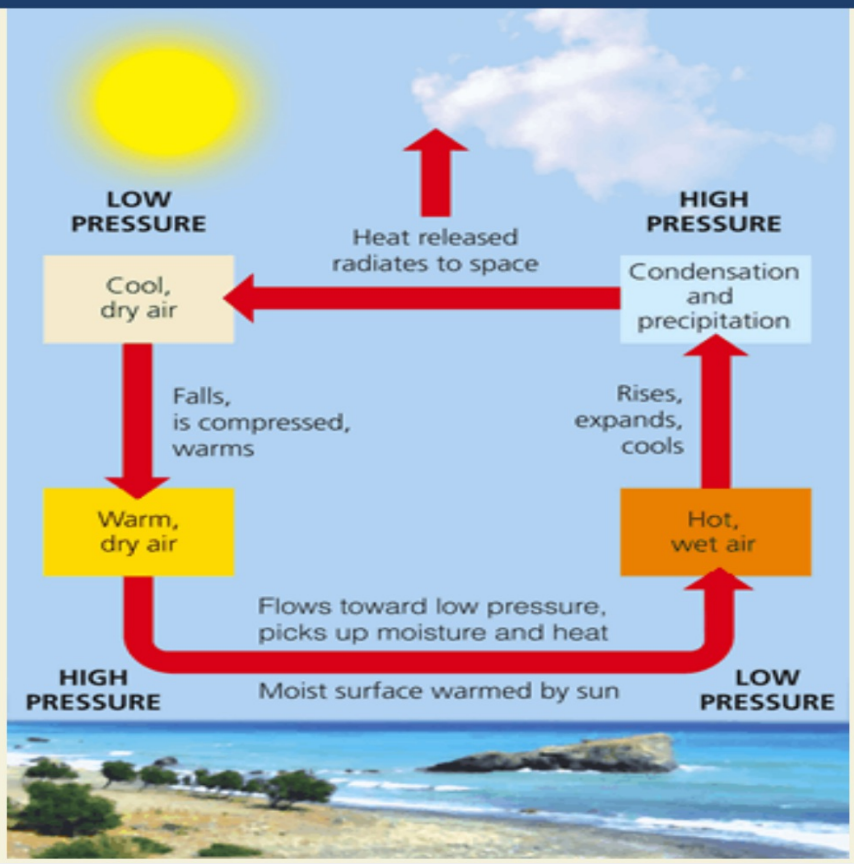


Fig. 7-4, p. 150

El Nino – Southern Oscillation

El Niño-Southern Oscillation

- Every few years
- Prevailing winds in tropical Pacific Ocean change direction'Affects much of earth's weather for 1-2 years

Link between air circulation, ocean currents, and biomes

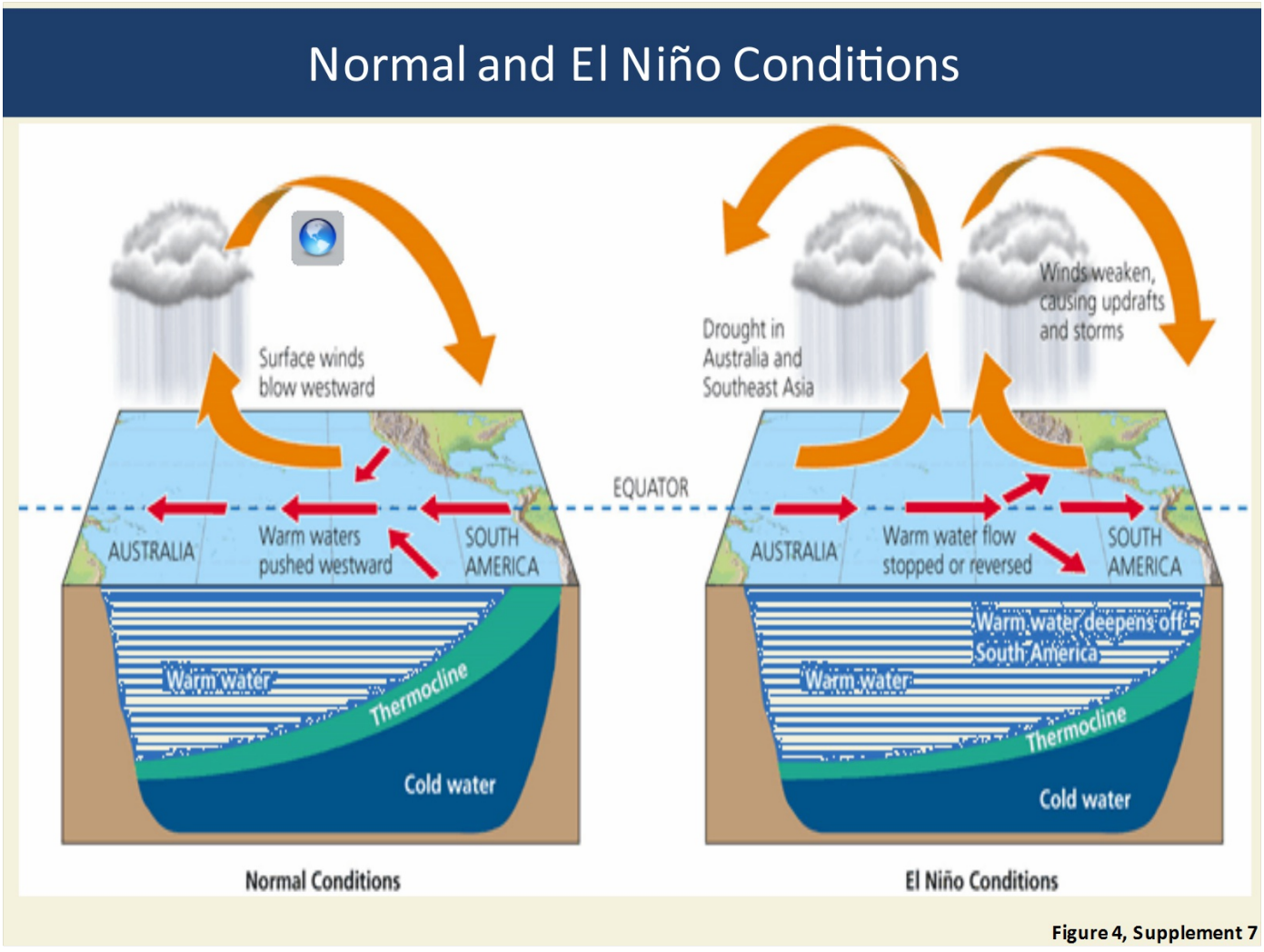


Figure 4, Supplement 7

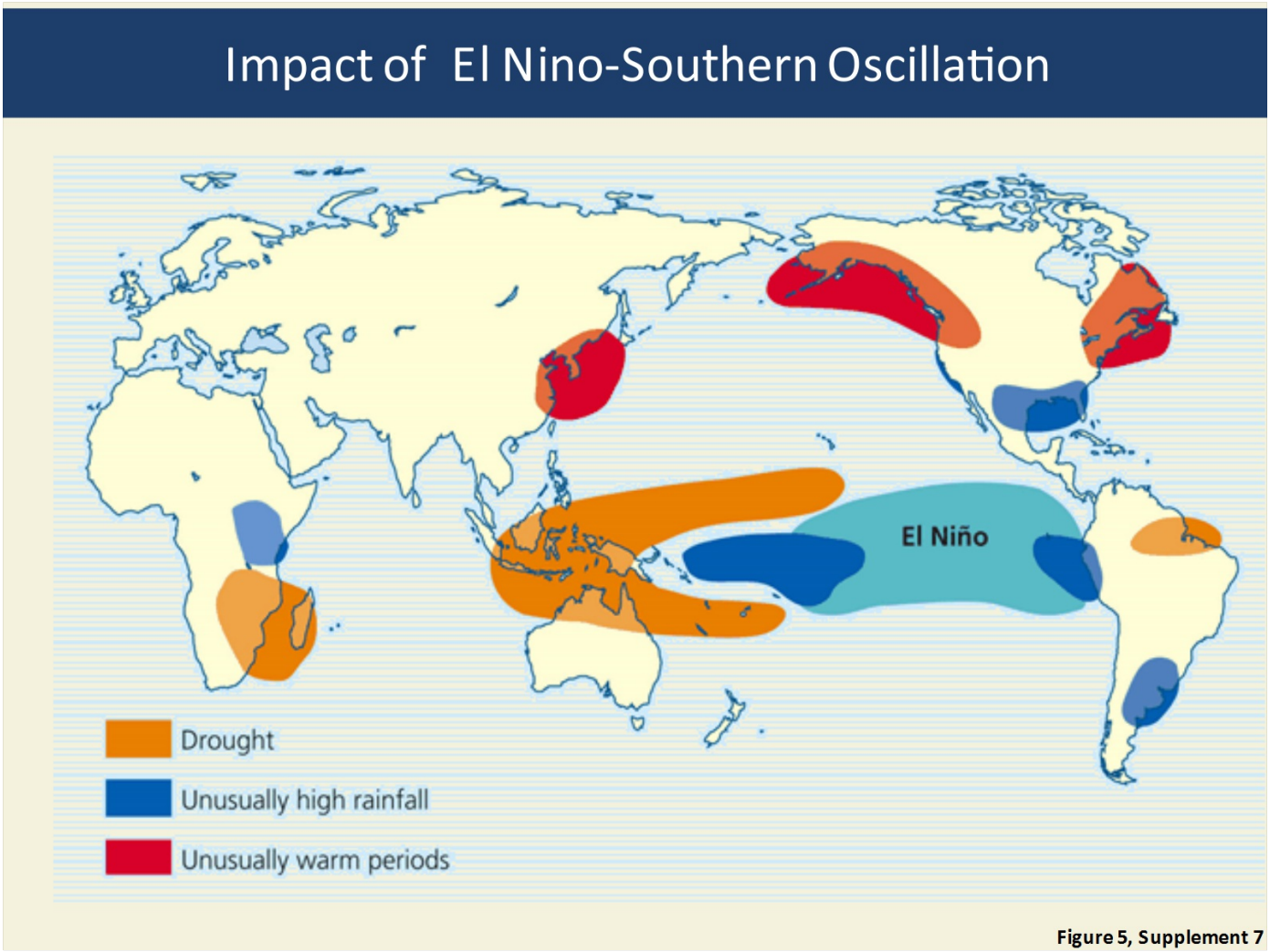
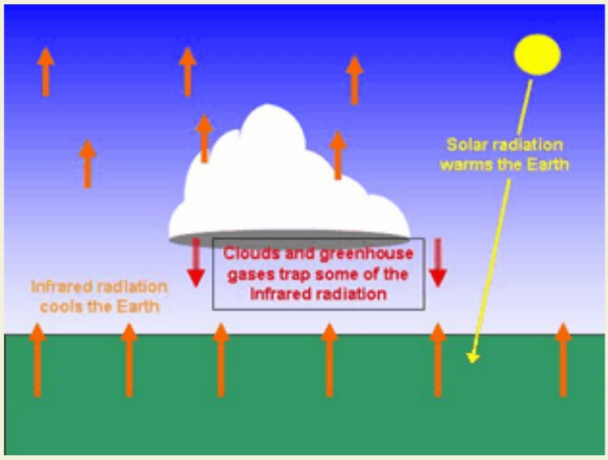


Figure 5, Supplement 7

Greenhouse Gases Warm the Lower Atmosphere

Greenhouse gases

- H_2O
- CO_2
- CH_4
- N_2O



Natural greenhouse effect

- Gases keep earth habitable

- Human-enhanced global warming

Flow of Energy to and from the Earth

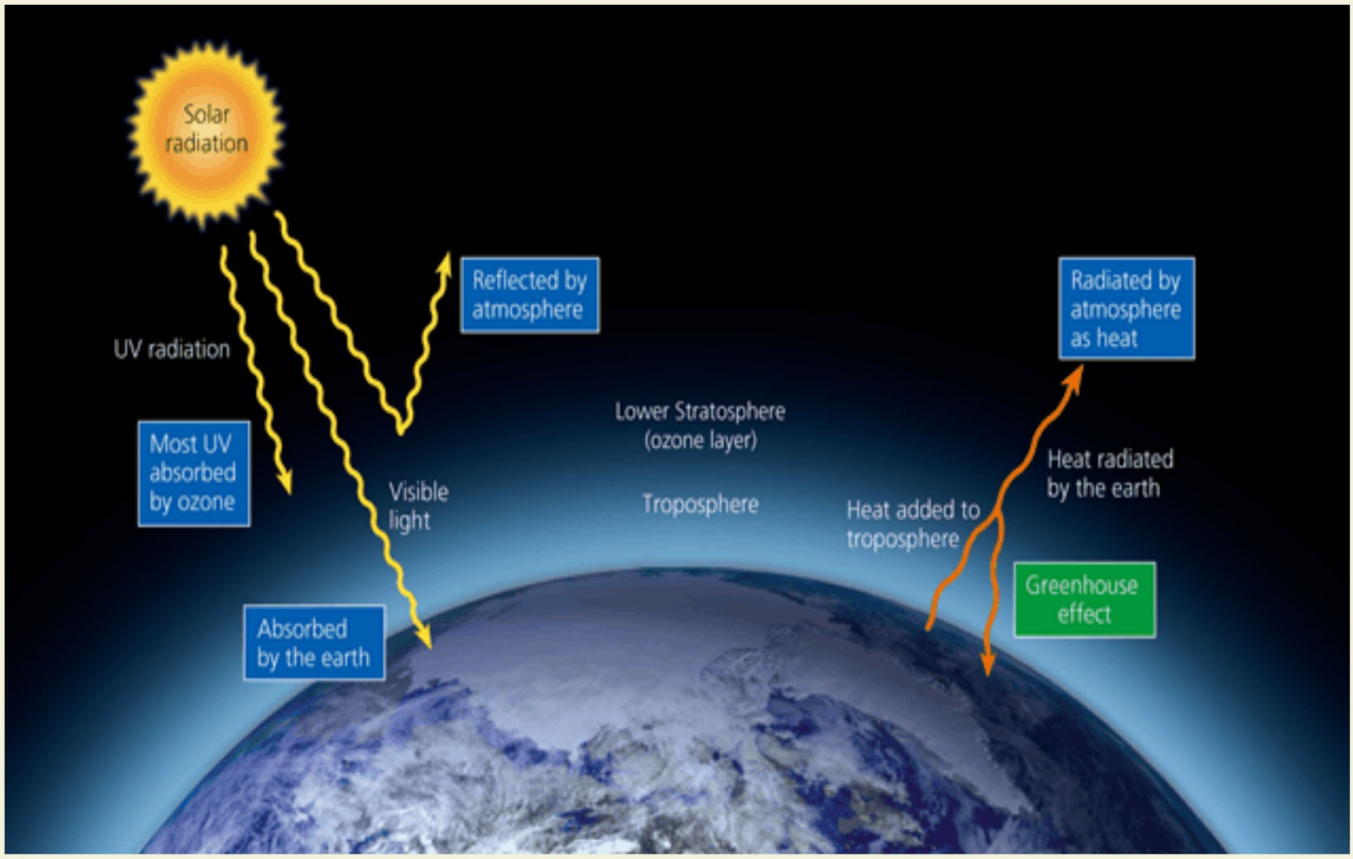
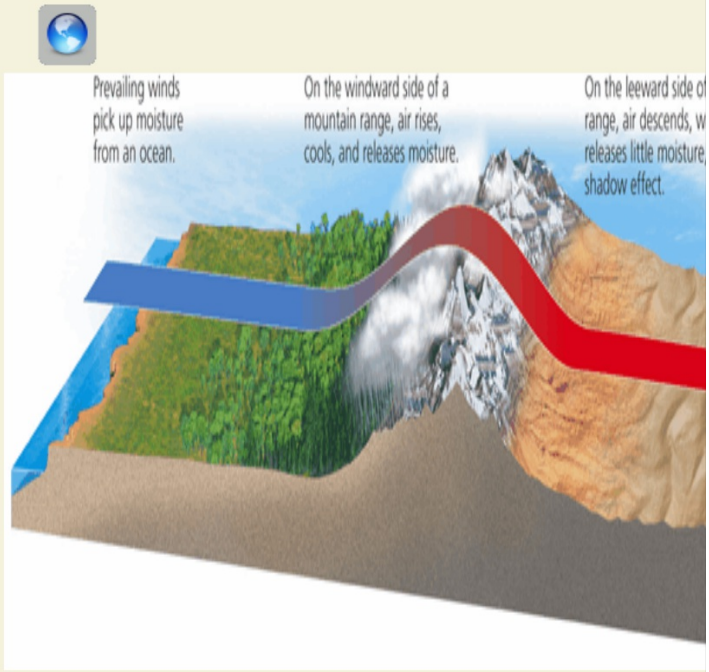


Fig. 3-4, p. 57

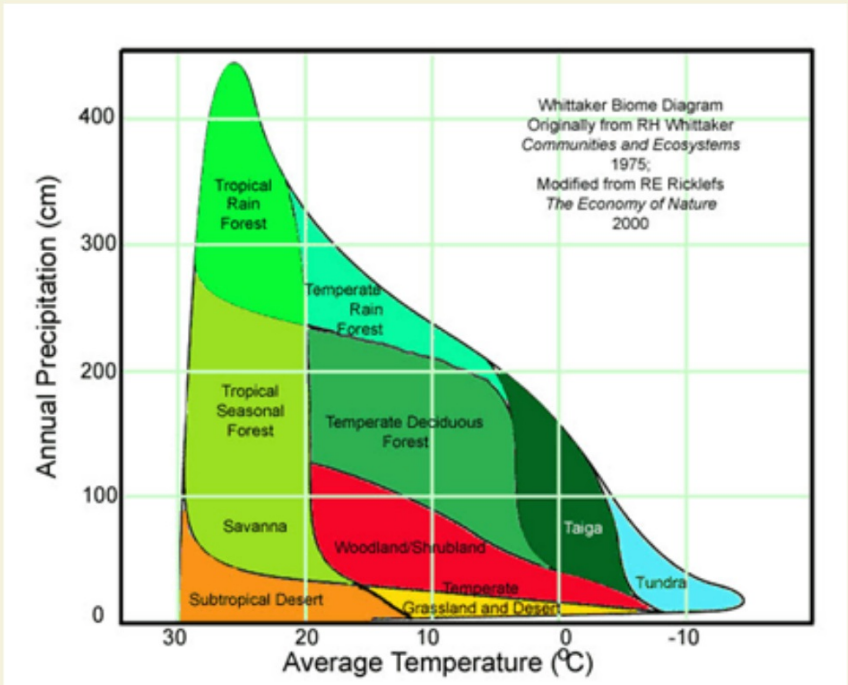
Earth's Surface Features Affect Local Climates

- Differential heat absorption by land and water
  - Land and sea breezes
- **Rain shadow effect**
  - Most precipitation falls on the windward side of mountain ranges
  - Deserts leeward

Cities create microclimates



7-2 How Does Climate Affect the Nature and Locations of Biomes?



Concept 7-2

Differences in average annual precipitation and temperature lead to the formation of tropical, temperate, and cold deserts, grasslands, and forests, and largely determine their locations.

Climate Helps Determine Where Organisms Can Live

Biomes: large land regions with certain types of climate and dominant plant life

- Not uniform
- Mosaic of patches

ABIOTIC FACTORS:

- Latitude and elevation
- Annual precipitation
- Temperature

The Earth's Major Biomes

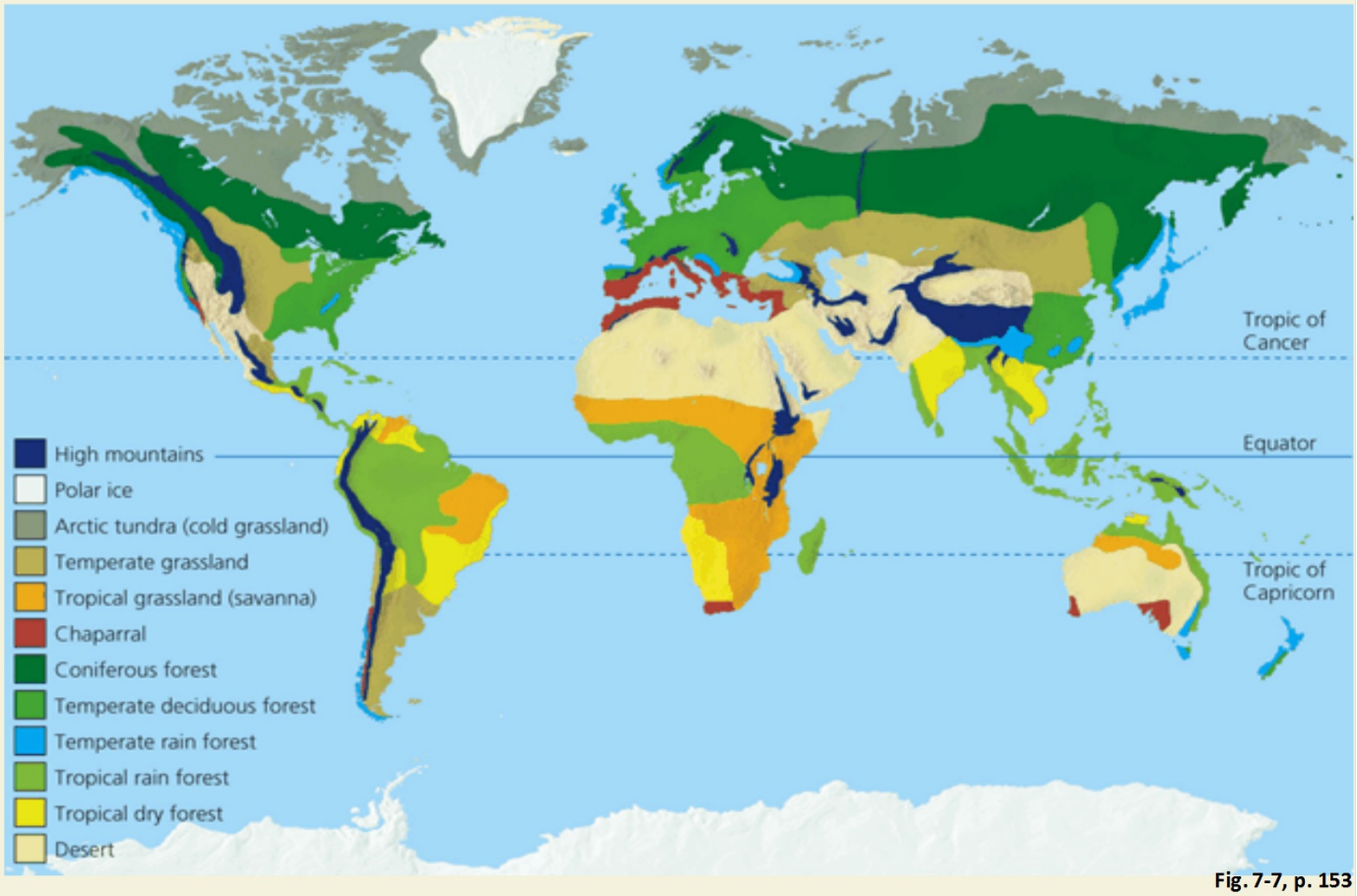


Fig. 7-7, p. 153

VIDEO: World's Biomes

Natural Capital: Average Precipitation and Average Temperature as Limiting Factors

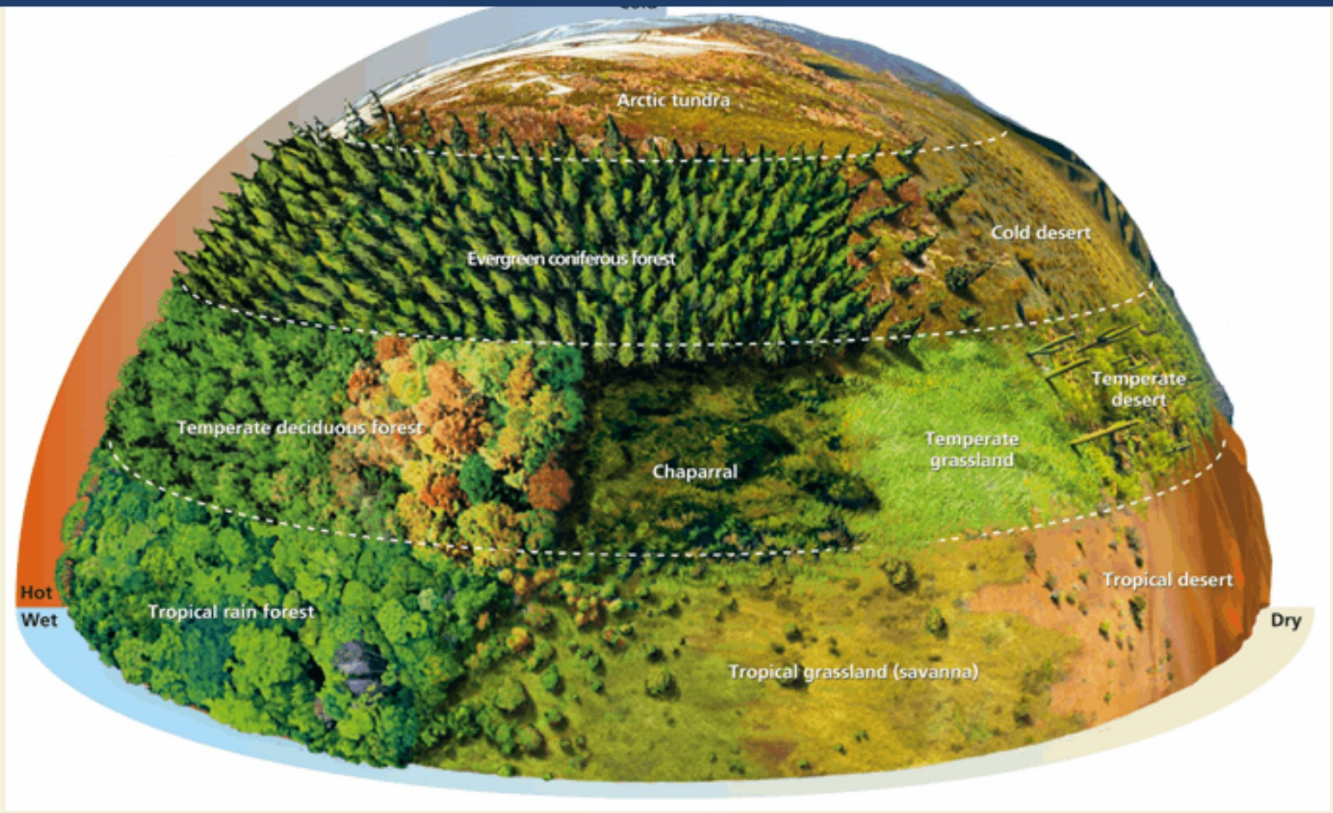


Fig. 7-9, p. 154

Global Plant Biodiversity

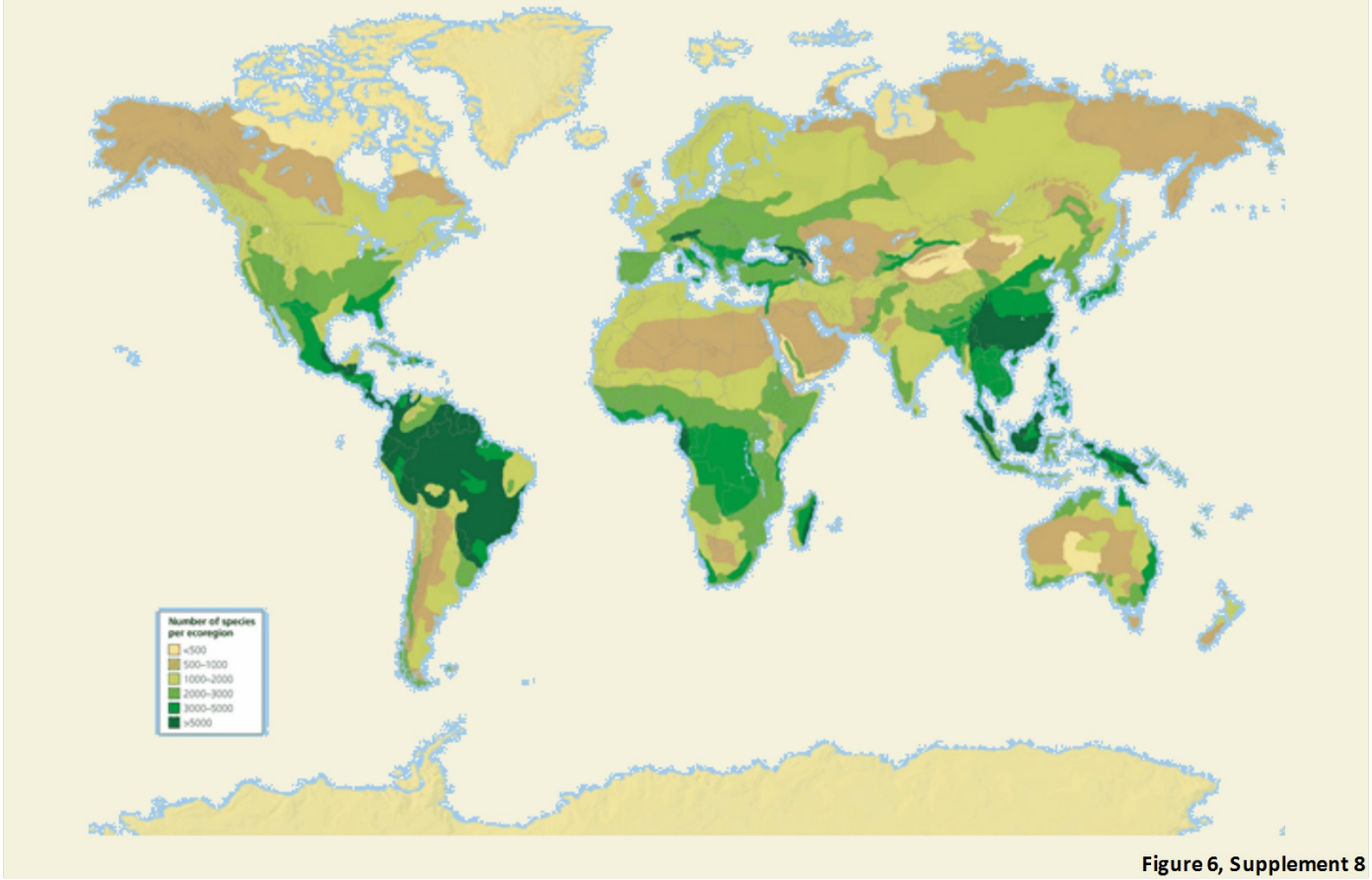


Figure 6, Supplement 8

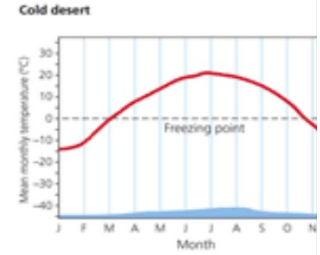
Three Major Types of Deserts

Tropical deserts

Temperate deserts

Cold deserts

- Fragile ecosystem
  - Slow plant growth
  - Low species diversity
  - Slow nutrient recycling
  - Lack of water



Temperate Desert Ecosystem in North America

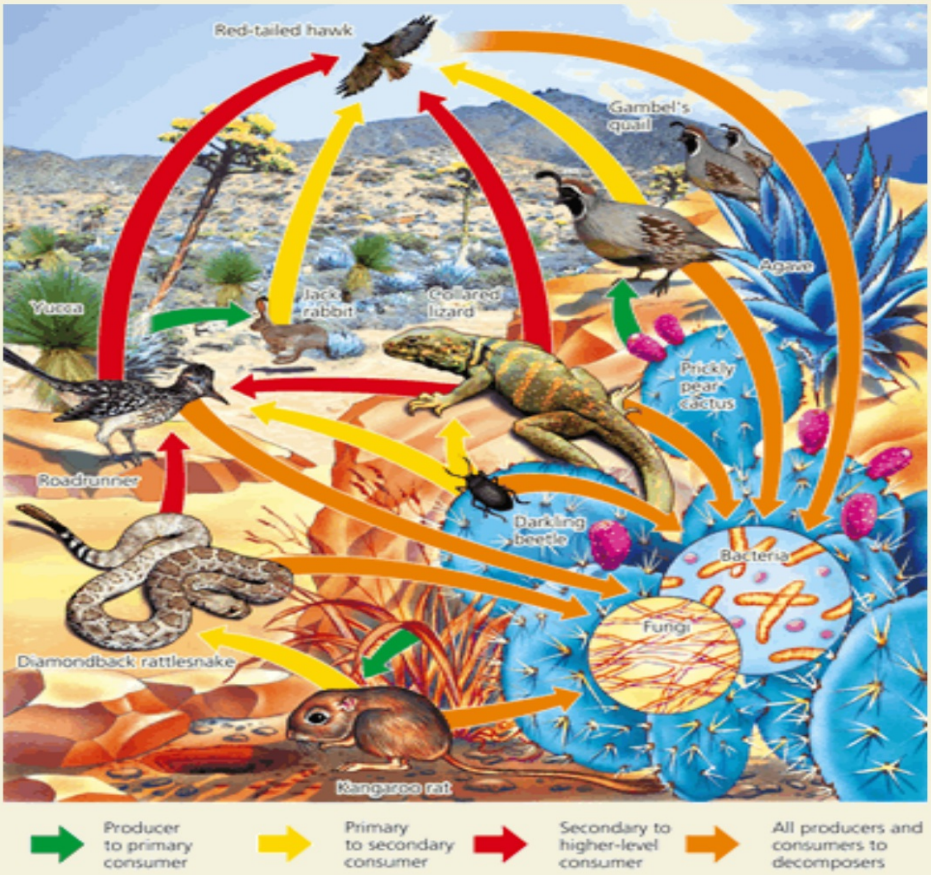
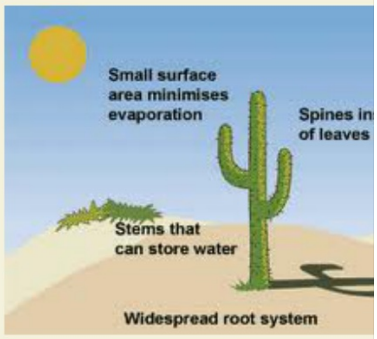
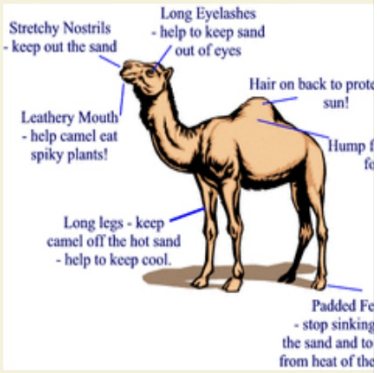


Figure 1, Supplement 6

Science Focus: Staying Alive in the Desert

- Beat the heat/every drop of water counts
- Plant adaptations
  - Succulents
  - Deep tap roots
- Animal strategies and adaptations
  - Physiology and anatomy
  - Behavior

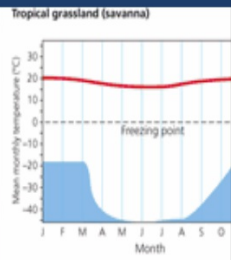


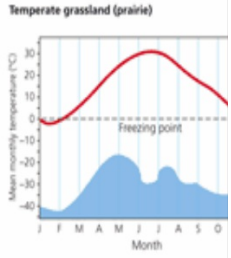


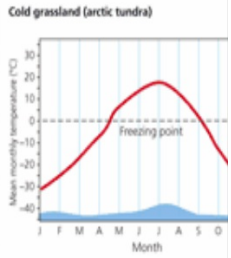
Wildflowers Bloom after Rain in Arizona

Fig. 7-A, p. 156

Three Major Types of Grasslands







Tropical

- Savanna
- Grazing & browsing animal

Temperate

- Cold winters and hot and dry summers
- Tall-grass or short-grass prairies
- Often converted to farmland

Cold (arctic tundra) - fragile biome

- Plants close to ground to conserve heat
- Most growth in short summer
- Animals have thick fur
- **Permafrost :** Underground soil that stays frozen

Temperate Tall-Grass Prairie Ecosystem in North America

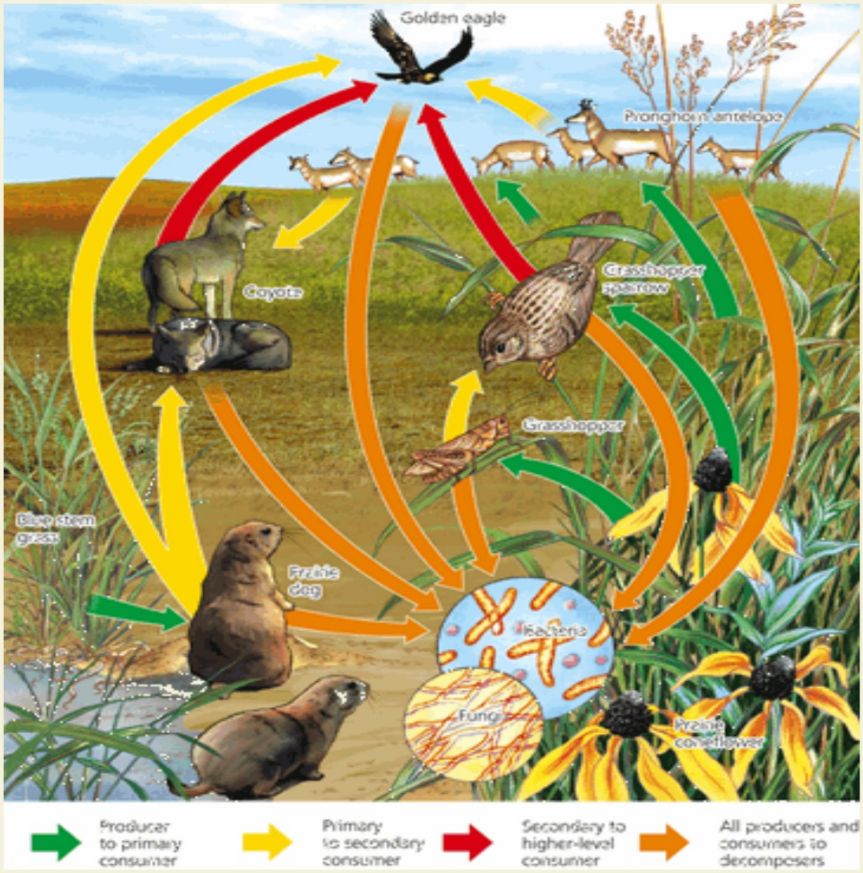


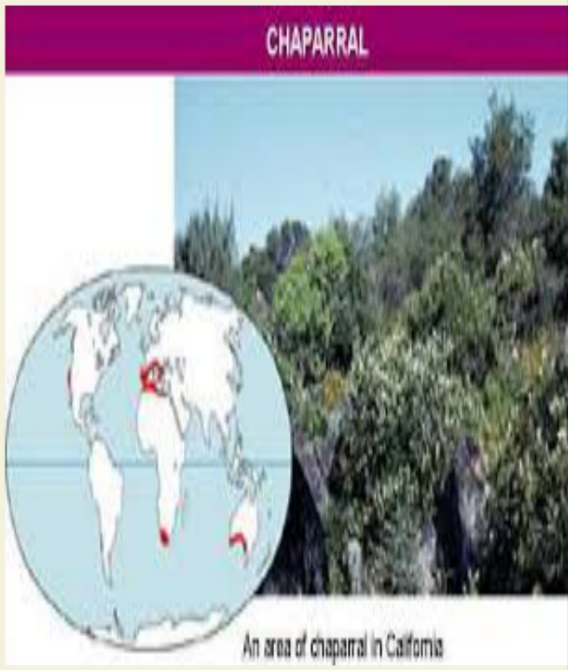
Figure 2, Supplement 6

Monoculture Crop Replacing Biologically Diverse Temperate Grassland

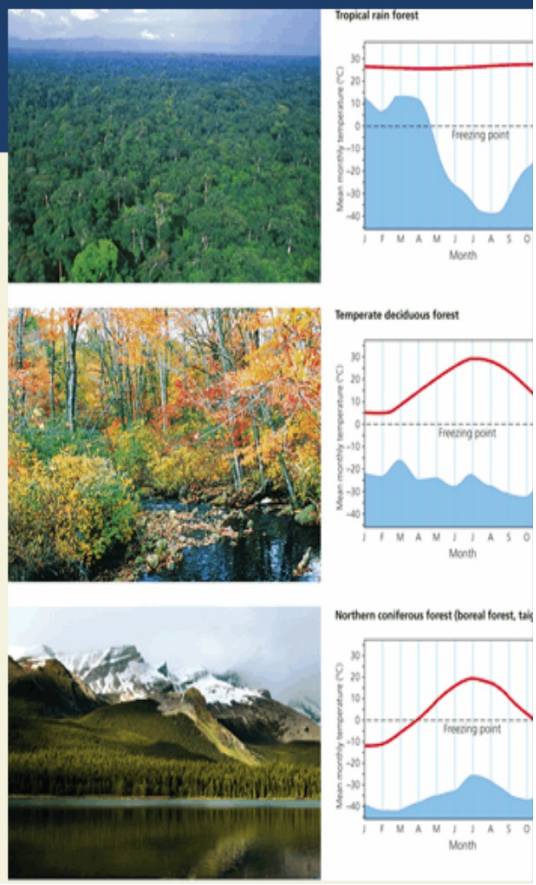
Fig. 1-10, p. 158

Temperate Shrubland: Nice Climate, Risky Place to Live

- **Chaparral**
- Near the sea: nice climate
- Prone to fires in the dry season



Three Major Types of Forests



Tropical

- Temperature and moisture
- Stratification of specialized plant and animal niches
- Little wind: significance
- Rapid recycling of scarce soil nutrients
- Impact of human activities

Temperate

- Temperature and moisture
- Broad-leaf trees
- Slow rate of decomposition: significance
- Impact of human activities

Cold (Northern coniferous and **boreal)**

- Temperature and moisture
- Few species of cone: bearing trees
- Slow decomposition: significance

Tropical Rain Forest Ecosystem

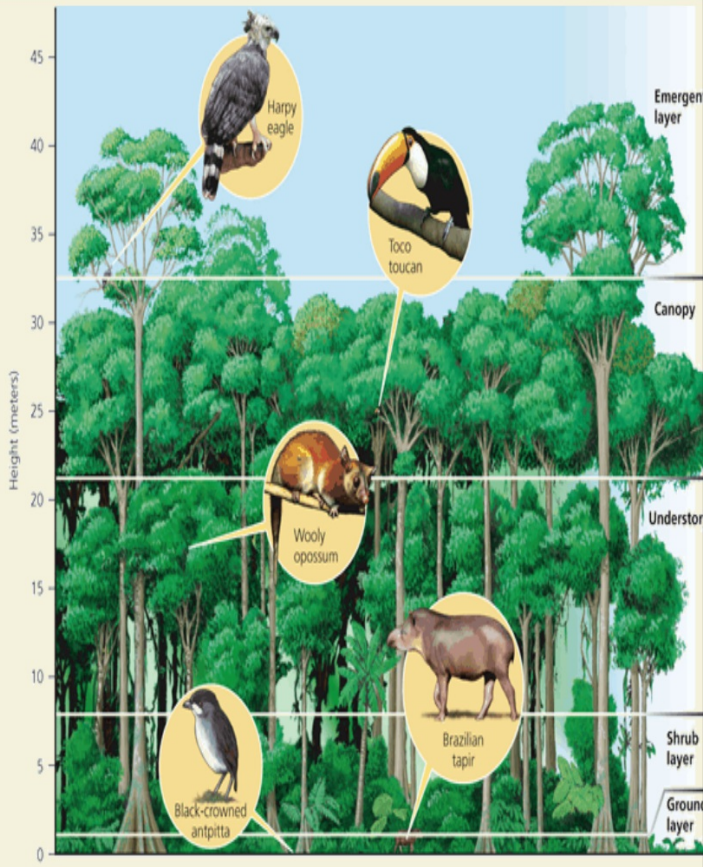
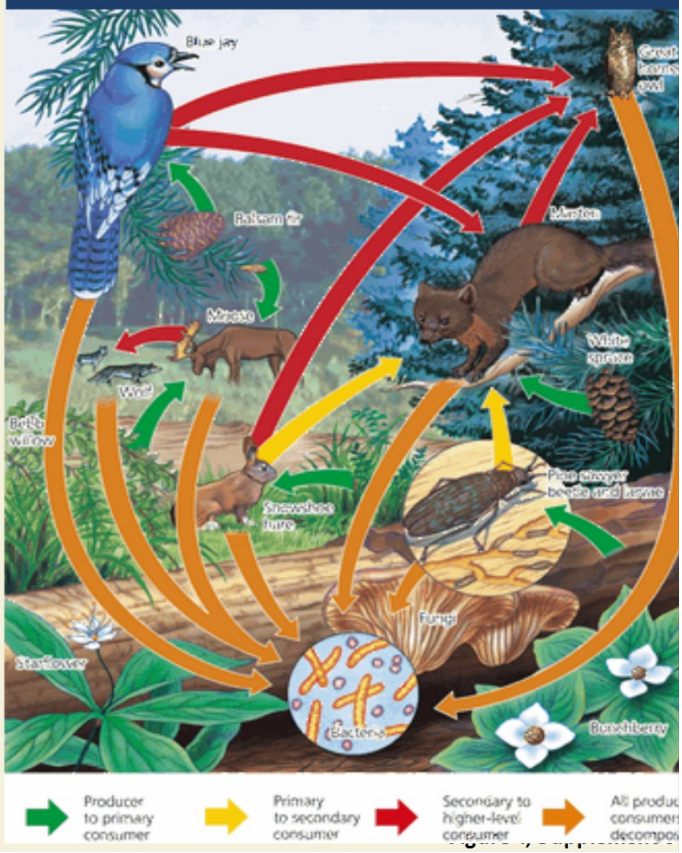


Fig. 7-14, p. 161

Temperate Deciduous Forest Ecosystem in North America

Evergreen Coniferous Fores Ecosystem in North Americ



Temperate Rain Forest in Washington State

Fig. 7-16, p. 163

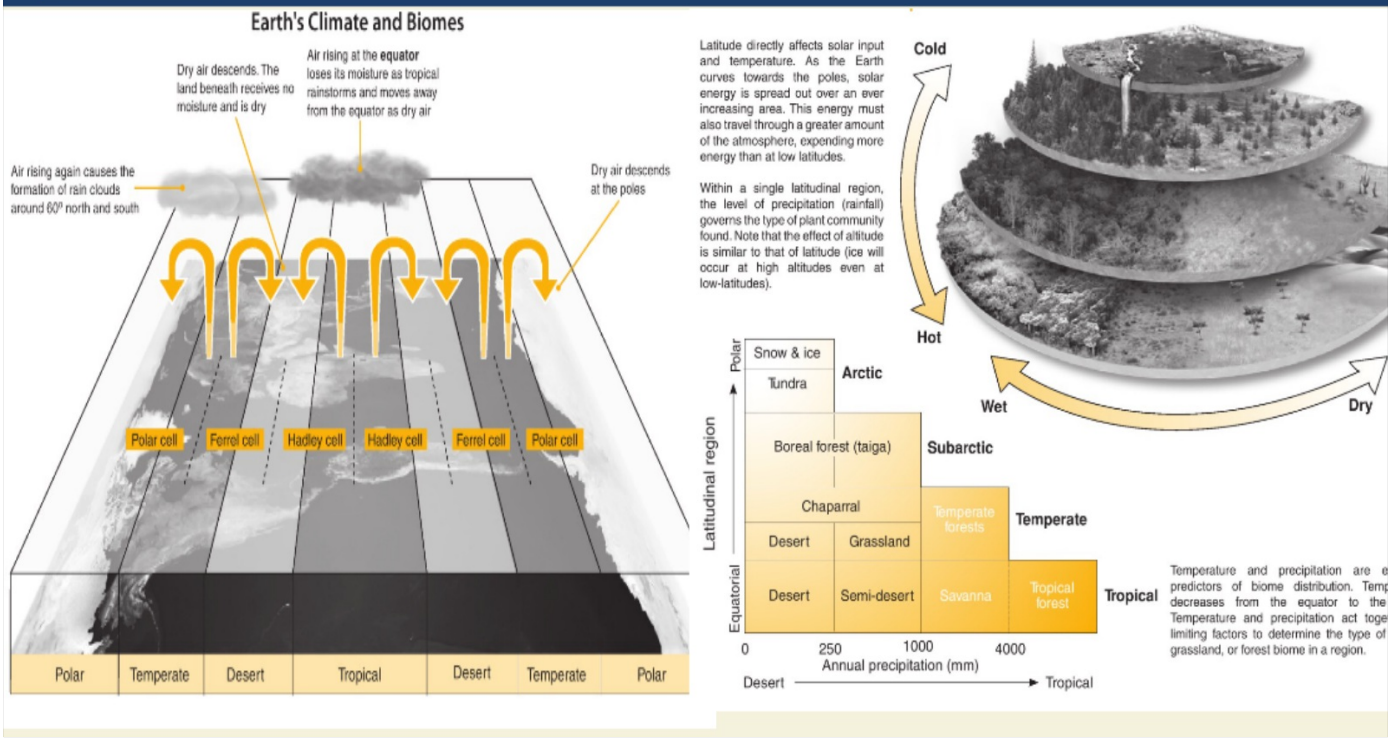
Mountains Play Important Ecological Roles

- Majority of the world's forests
- Islands of biodiversity
- Habitats for endemic species
- Help regulate the earth's climat
- Major storehouses of water
  - Role in hydrologic cycle

Mount Rainier National Park in Washington State

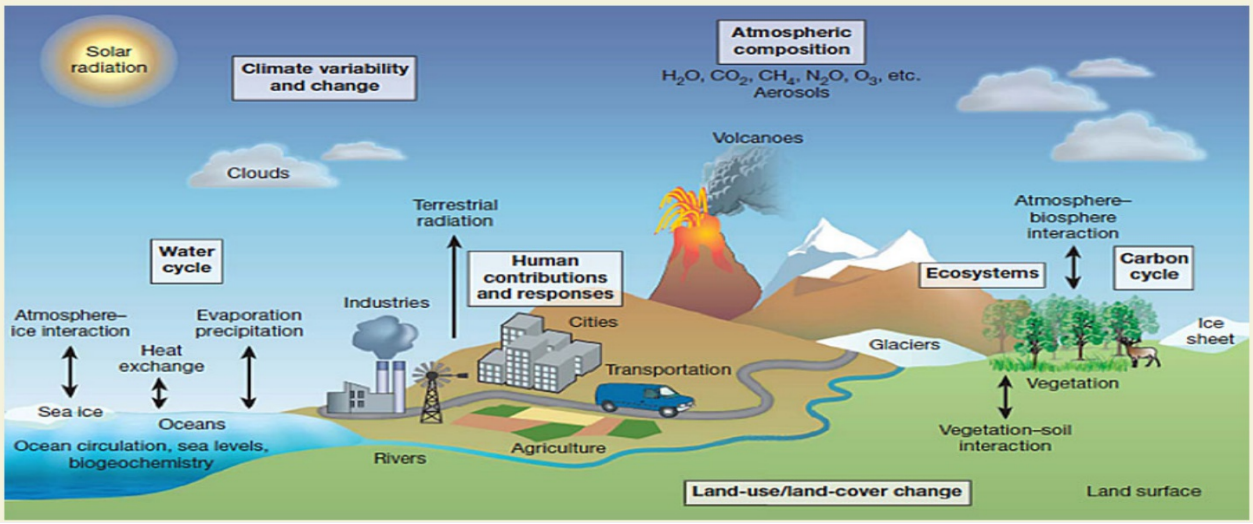
Biomes

Directions: Read the information and answer the questions in your composition book.

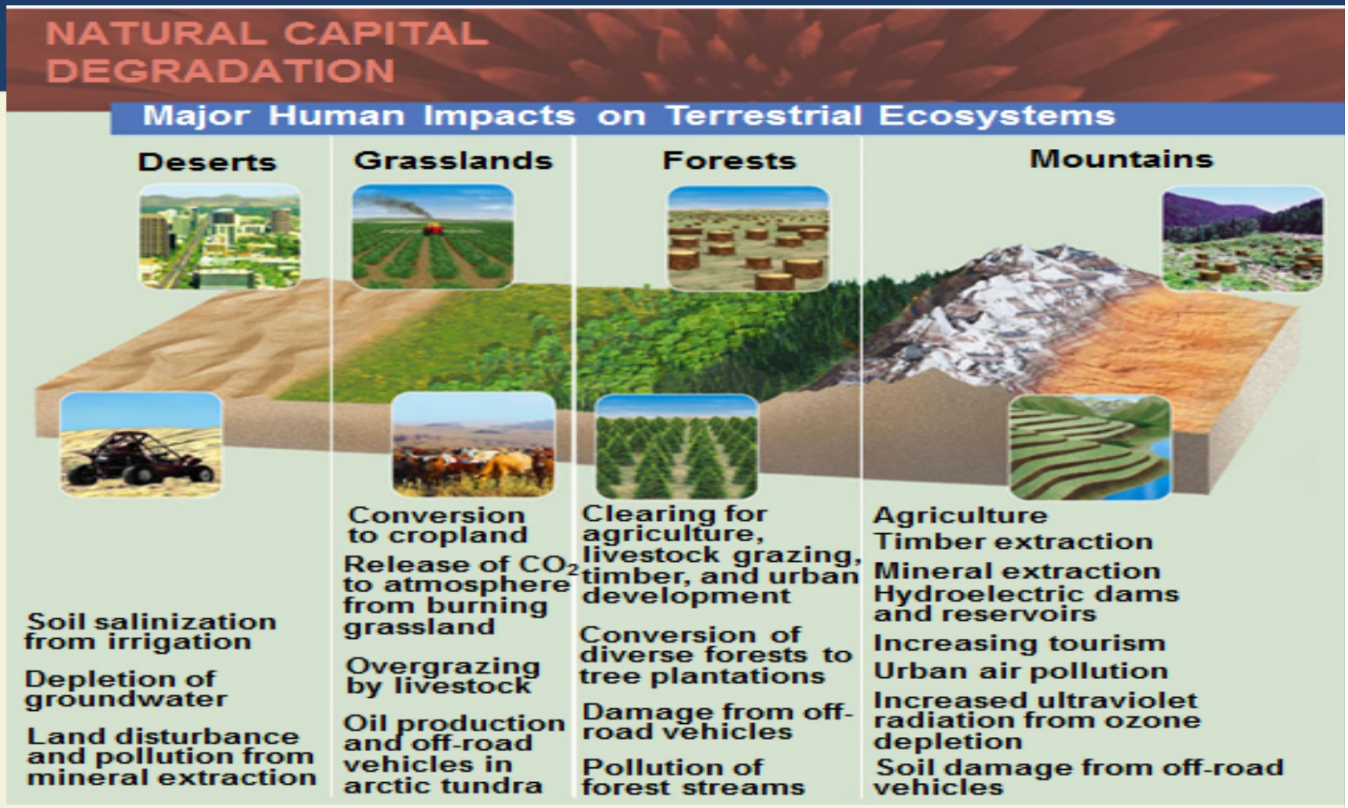


7-3 How Have We Affected the World's Terrestrial Ecosystems?

Concept 7-3 *In many areas, human activities are impairing ecological and economic services provided by the earth's deserts, grasslands, forests, and mountains.*



Humans Have Disturbed Most of the Earth's Lands



Three Big Ideas

1. Differences in climate, based mostly on long-term differences in average temperature and precipitation, largely determine the types and locations of the earth's deserts, grasslands, and forests.
2. The earth's terrestrial systems provide important ecological and economic services.
3. Human activities are degrading and disrupting many of the ecological and economic services provided by the earth's terrestrial ecosystems.