

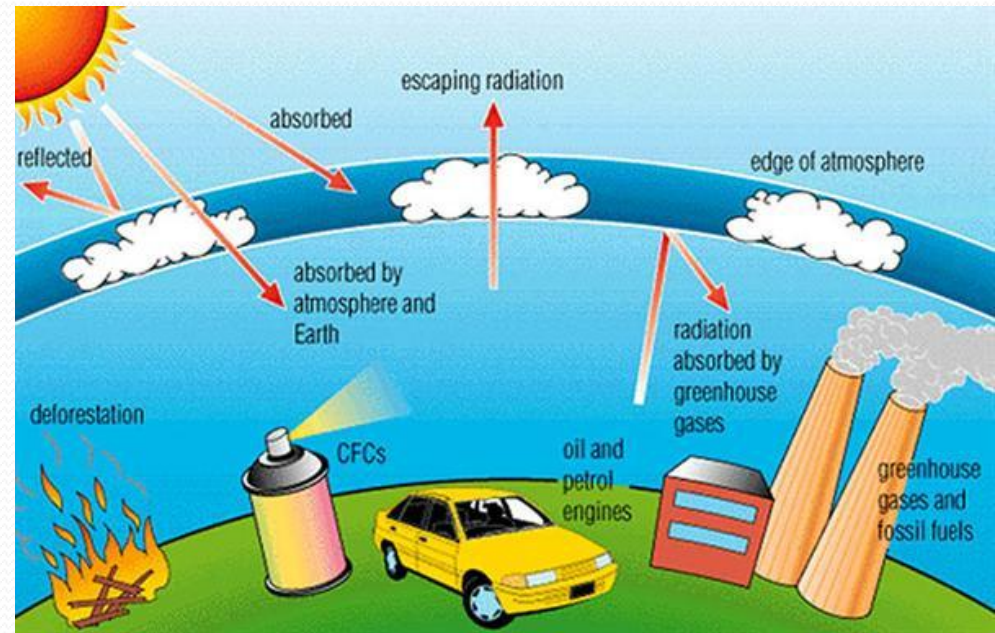
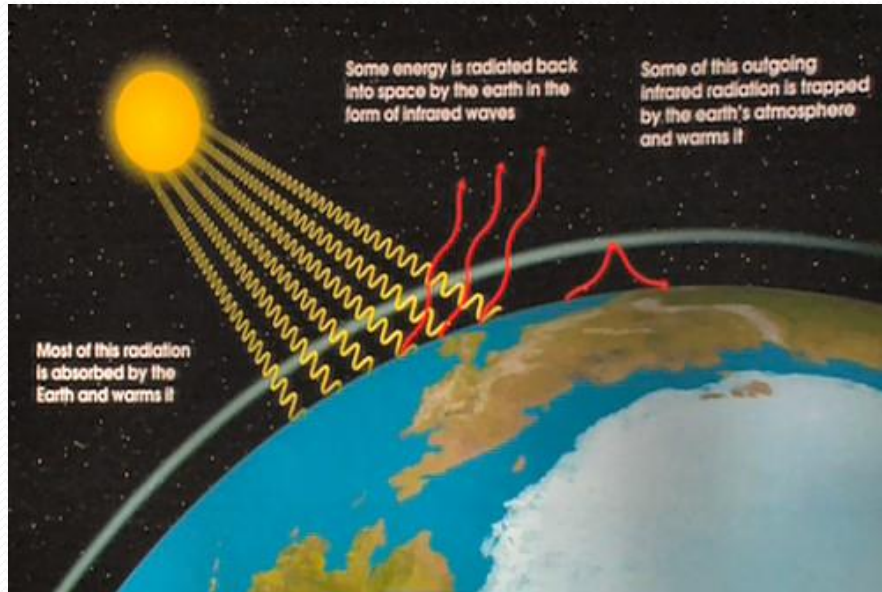
# Chapter 4

## Ecosystems and Communities

# 4-1 The Role of the Climate

- Weather-the day to day condition of the Earth's atmosphere
- Climate-the average year after year conditions of temperature and precipitation in a particular region
- The Greenhouse Effect-Heat is retained near the Earth by a layer of gases in the Earth's atmosphere
  - Gases include CO<sub>2</sub>, H<sub>2</sub>O and CH<sub>4</sub>(methane)
  - Called greenhouse gases

# Greenhouse Effect



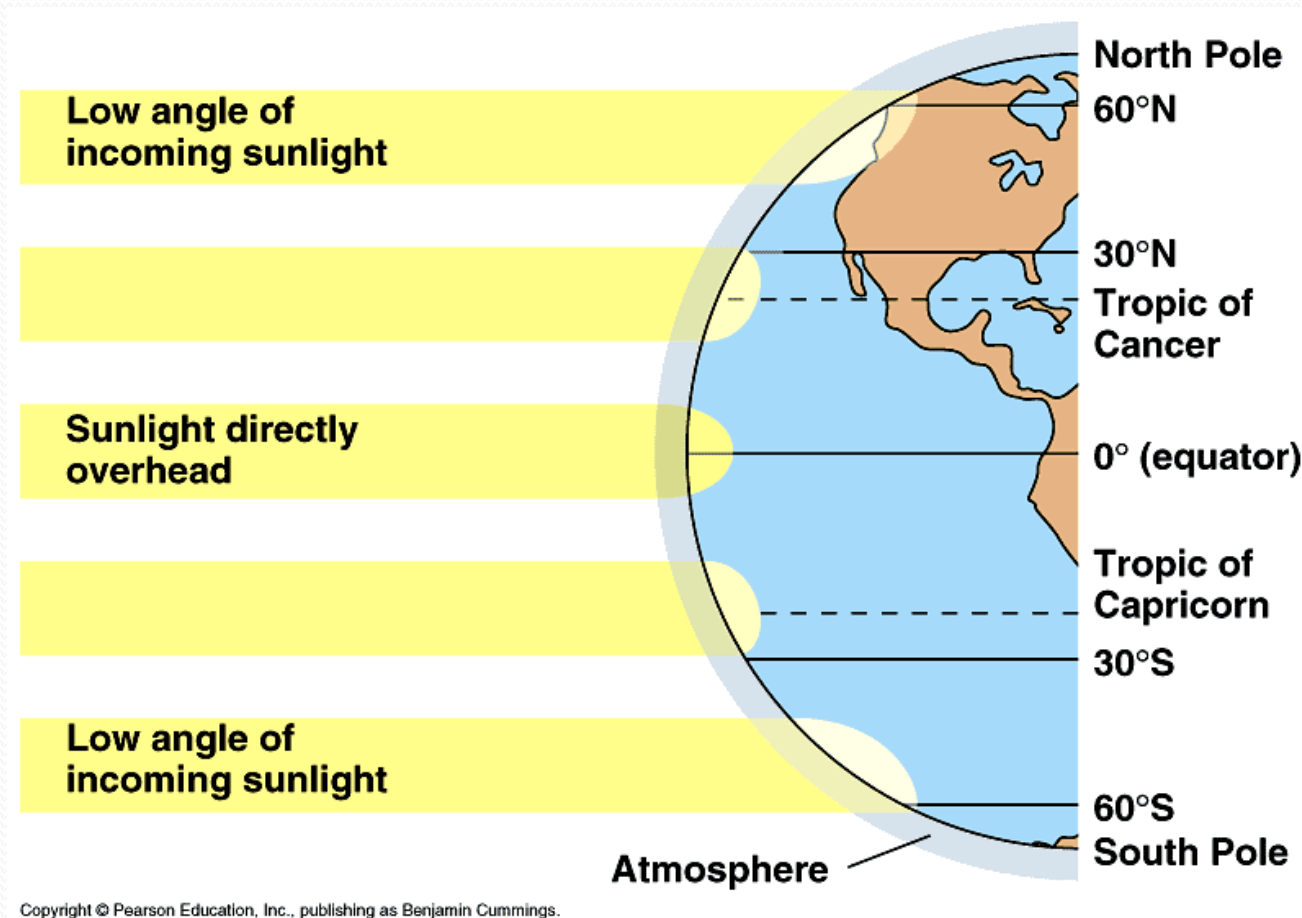
# 4-1 The Role of Climate

- The Effect of Latitude on Climate
- The earth is tilted on its axis so solar radiation strikes different parts of the earth with different angle and energy
- As a result of different latitudes and the angle of heating, earth has 3 main climate zones
  - Polar
  - Temperate
  - Tropical

# 4-1 The Role of Climate-The Effect of Latitude on Climate

- Polar-sun strikes at a low angle; between 66.5 and 90 north and south
- Temperate-between polar zones and the tropics; more affected by the changing angles of the sun throughout the year; climate ranges from hot to cold, depending on the season
- Tropical zone-Near the equator, between 23.5 north and south of the equator; receives direct or near direct sunlight all year round

# 4-1 The Role of Climate



# 4-1 The Role of Climate

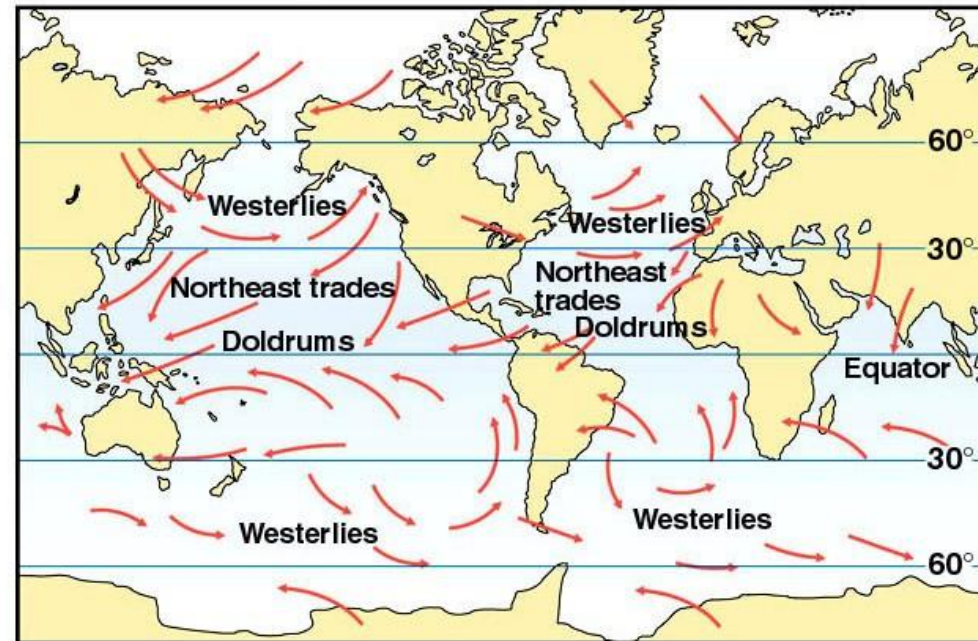
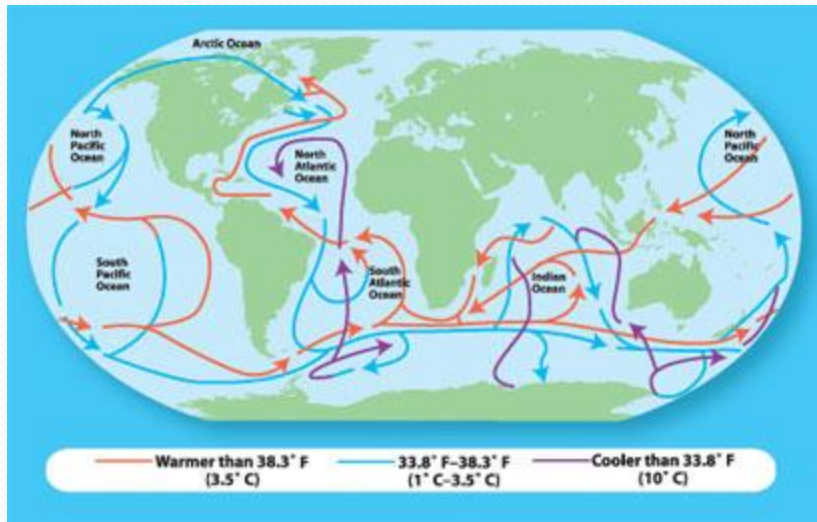
- Heat Transport in the Biosphere-The unequal heating of the earth's surface drives winds and ocean currents because warm air rises and cold air sinks under the warm air
- Land masses can also affect weather-mountain ranges cause moist air to rise and cool, then it condenses and form clouds, which precipitate



# The Role of Climate-Wind and Ocean Currents

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## Major Wind Currents





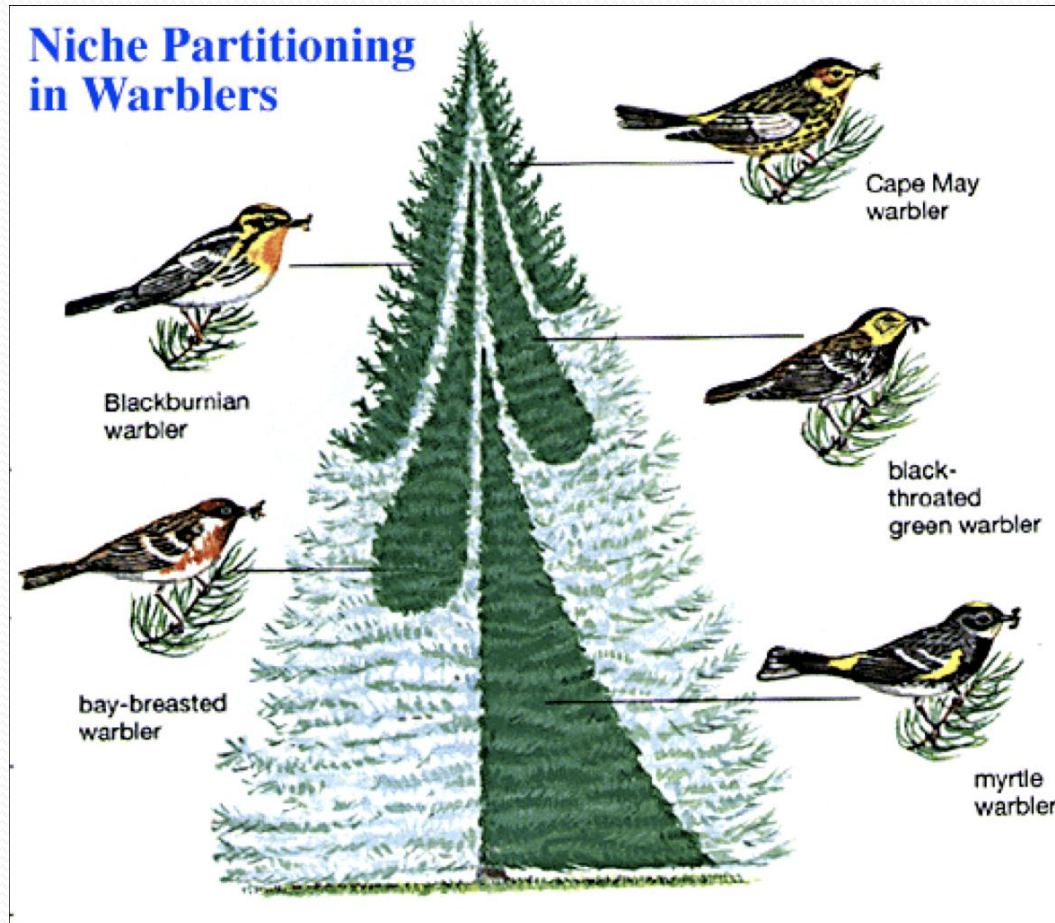
# 4-2 What Shapes an Ecosystem

- Biotic and Abiotic factors
- Biotic factors-biological influences on organisms within the ecosystem
- Abiotic factors-physical or non-living factors that shape an ecosystem
- Together, biotic and abiotic factors determine the survival and growth of an organism and the productivity of the ecosystem in which the organism lives

# 4-2 What Shapes an Ecosystem

- The area where an organism lives is its habitat
- A habitat includes biotic and abiotic factors
- A habitat is like an address; a niche is like a job
- Niche is a full range of physical and biological conditions in which the organism lives and the way in which the organism uses these conditions
  - Could include what is eaten, how the food is obtained, and what other species uses the organism as food, when and how it reproduces and physical conditions needed to survive

# 4-2 What Shapes an Ecosystem- Niches



# 4-2 What Shapes an Ecosystem

- Community Interactions affect an ecosystem
- Competition-occurs when organisms of the same or different species attempt to use the same resources in the same place at the same time
  - Resource-any necessity of life-water, nutrients, light, food
  - Direct competition often results in a winner and a lose, the losing organism failing to survive
  - Competitive exclusion principle-no two species can occupy the same niche in the same habitat at the same time

# 4-2 What Shapes an Ecosystem

- Predation-an interaction in which one organism captures and feeds on another organism
  - The organism that does the eating is the predator
  - The organism that is killed and eaten is the prey

# 4-2 What Shapes an Ecosystem

- Symbiosis-Any relationship in which two species live closely together
  - Mutualism-both species benefit-Ex: flowers and insects
  - Commensalism-one species benefits, the second is neither helped nor harmed-Ex: barnacles on a whale's skin
  - Parasitism-one organism lives on or inside another and harms it-Ex: tapeworms, fleas and ticks



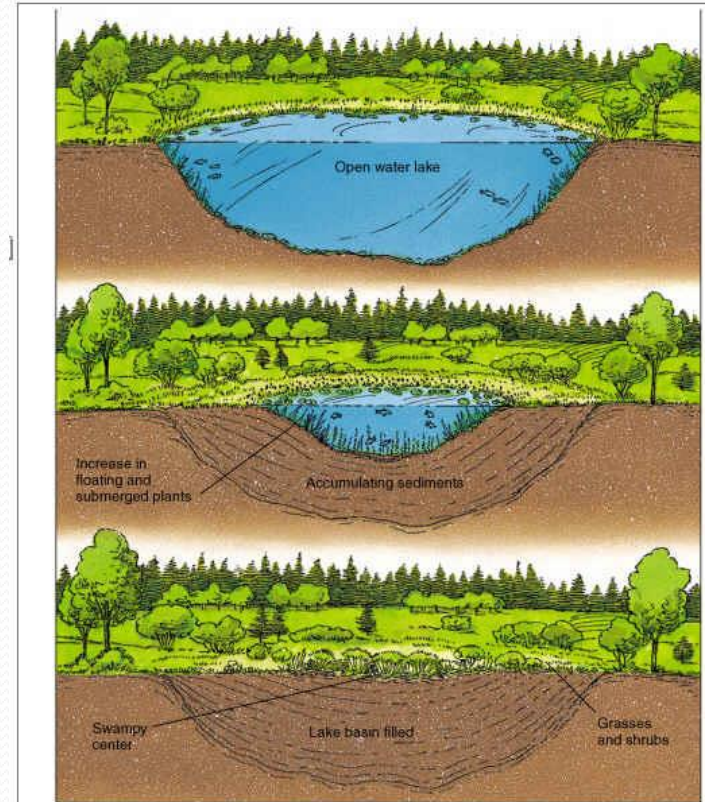
# 4-2 What Shapes an Ecosystem

- Ecological Succession
- Ecosystems are constantly changing in response to natural and human disturbances. As an ecosystem changes, older inhabitants gradually die off and new organisms move in, causing further changes in the community
- Called ecological succession

# 4-2 What Shapes an Ecosystem

- Primary Succession-succession that takes place on surfaces where no soil exists
  - The first species to appear are the pioneer species
  - Example lichen growing on volcanic rocks
- Secondary Succession-when a disturbance of some kind changes an existing community without removing the soil
  - Example new plants growing back after a forest fire

# 4-2 What Shapes an Ecosystem



Caption

(a) What begins as a lake gradually fills with organic and inorganic sediments, which successively shrink the area of the pond. A bog forms, then a marshy area, and finally a meadow completes the successional stages. (b) Aquatic succession in a mountain lake. [Photo by Bobbé Christopherson.]

# 4-2 What Shapes an Ecosystem

- Succession in a Marine Ecosystem
  - A large whale died and sunk to the bottom of the ocean
  - Scavengers and decomposers are attracted to the carcass
  - Small fish, crabs, snails and other marine animals are supported by the carcass
  - Finally, heterotrophic bacteria decompose the oils in the whale bones, and release chemicals that attract other chemotropic bacteria
  - Chemotropic bacteria support snails, mussels, crabs, etc.



# 4-2 Succession in a Marine Ecosystem



## 4-3 Land Biomes

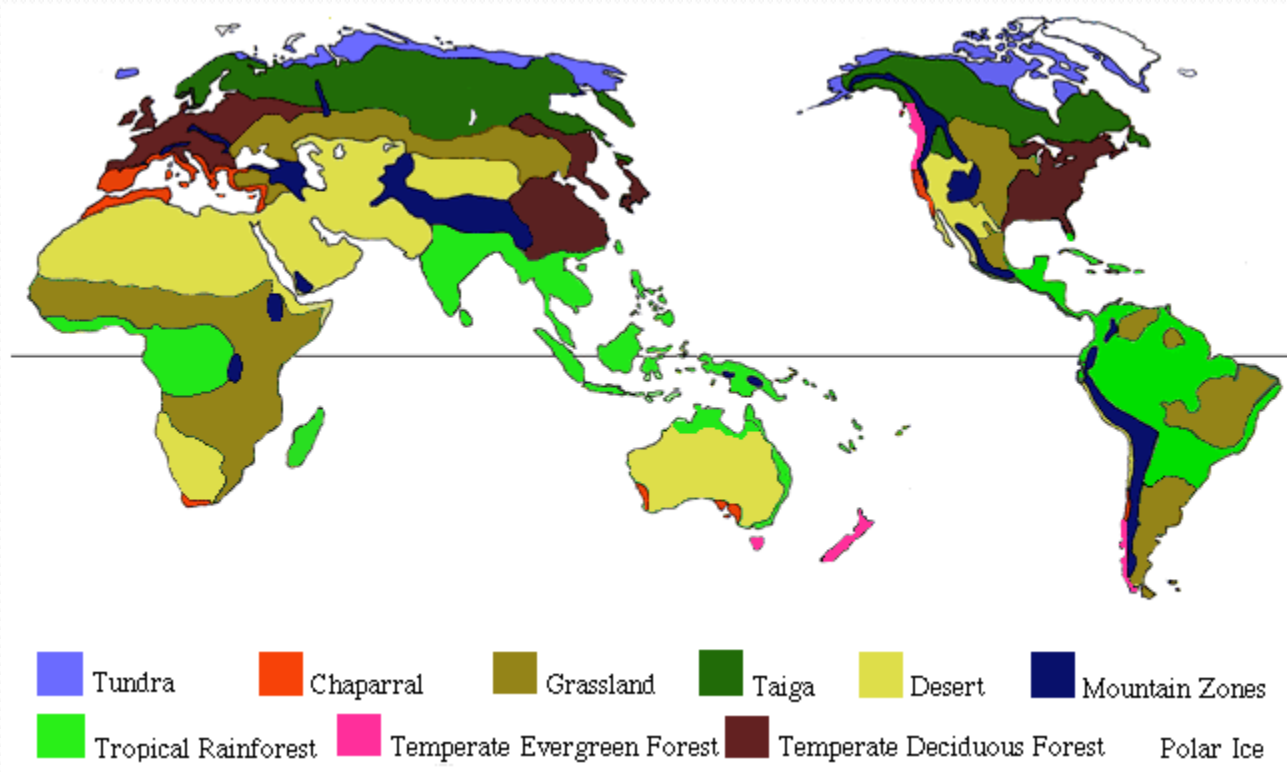
- Biome-a particular physical environment that contains a characteristic collection of plants and animals. Example: temperate grasslands-large areas of flat land in regions with dry, temperate climates on several continents
- Microclimate-climate within a small area within a small area of a biome that is significantly different from the climate around it. Example: Sunset area in San Francisco, or at the northern coast of California



# 4-3 Land Biomes

- Major Biomes
- Tropical rain forest, tropical dry forest, tropical savanna, desert, temperate grassland, temperate woodland and shrubland, temperate forest, northwestern coniferous forest, boreal forest and tundra
- Boundries are transitional area between the biomes

# 4-3 Major Biomes



# 4-3 Major Biomes

- See pages 100-102
- Make a chart in your notes summarizing the information
  - 6 columns, one for each biome
  - 4 rows
    - Abiotic factors
    - Dominant plants
    - Dominant wildlife
    - Geographic distribution

## 4-3 Other Land Areas

- Some areas of land don't fall neatly into a category
  - Mountain Ranges
  - Polar Ice Caps

# 4-4 Aquatic Ecosystems

- Determined primarily by the depth, flow, temperature and chemistry of the overlying water
- Freshwater Ecosystems
  - Flowing water-stream, creek, river
    - Water flows through(in and out)
  - Standing water-Lakes and ponds
    - Circulation within the body of water distributes nutrients
    - Phytoplankton-algae; free floating; base of many food webs
    - Zooplankton-Planktonic animals that feed on the phytoplankton
  - Freshwater wetlands
    - Water covers the soil or is at or near the surface of the soil for at least part of the year
    - Includes bogs, marshes and swamps

# 4-4 Aquatic Ecosystems

- Estuaries-wetlands formed where rivers meet the sea
  - Fresh and salt water
  - Food web different from most ecosystems-most primary production is not consumed by herbivores, but enters food web as detritus
  - Provides food for clams, worms and sponges
  - Contain lot of biomass but few species
  - Serve as a spawning nursery for snails and crabs
  - Many animals and water fowl feed and nest there
  - Salt marshes and mangrove swamps



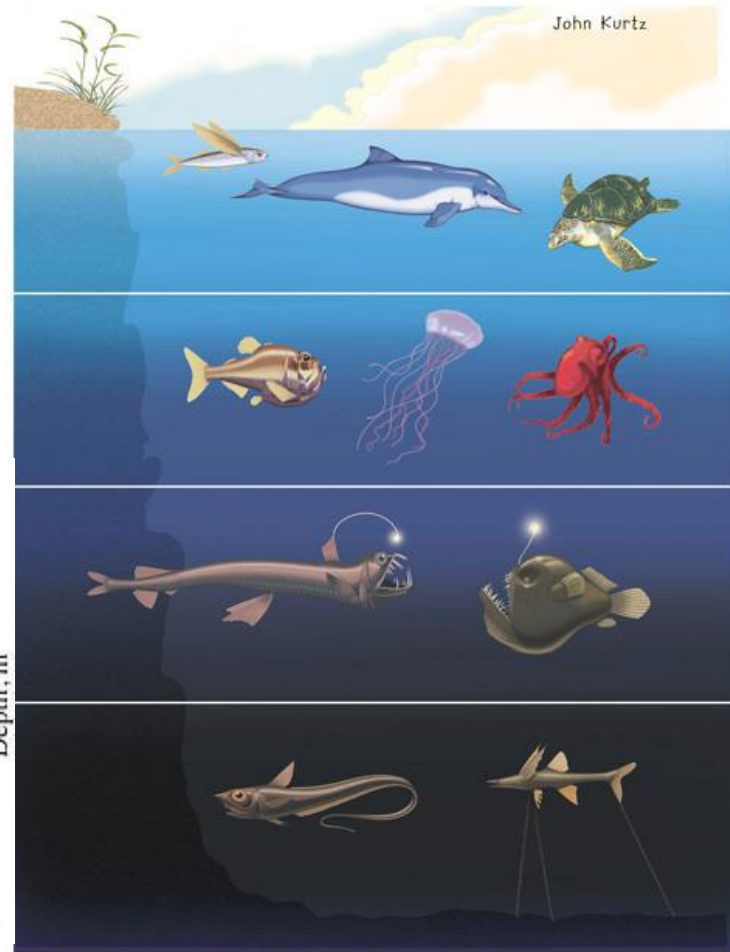
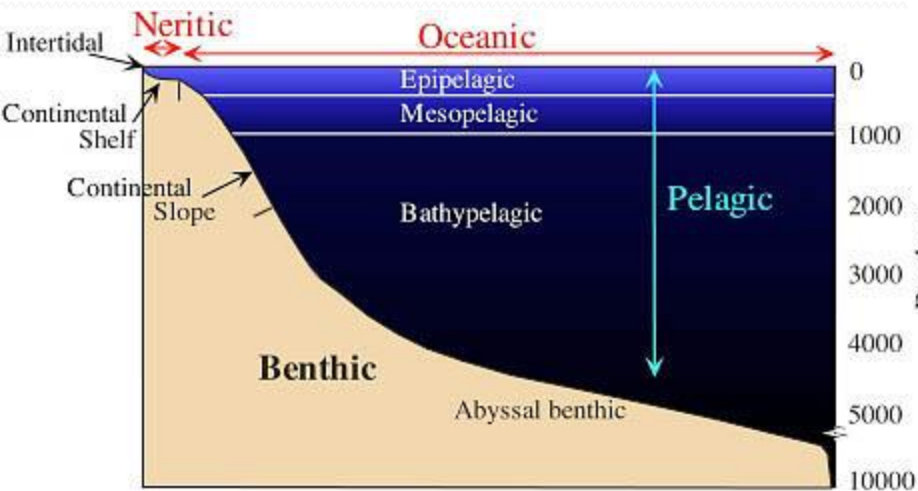
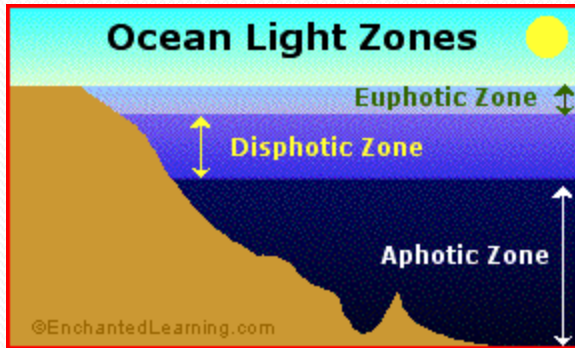
# 4-4 Estuaries



# 4-4 Marine Ecosystems

- Photic zone-photosynthesis can occur
- Aphotic zone-permanently dark; no photosynthesis
- Zones are also based on depth and distance from shore
  - the intertidal zone
  - the coastal zone
  - the open ocean

# 4-4 Marine Ecosystems



# 4-4 Marine Ecosystems

- Intertidal Zone
  - Organisms exposed to extreme changes in their surroundings every day
  - Competition leads to zonation, or horizontal banding of organisms that live in a habitat
- Coastal Ocean
  - Extends from low tide mark to the outer edge of the continental shelf
  - Often shallow and photic
  - Kelp forests-giant brown algae that can grow 50 cm/day



# Marine Ecosystems



# 4-4 Marine Ecosystems

- Coral Reefs
  - Warm shallow coastal water, less than 40 feet deep
  - Most diverse and productive environments on earth
  - Animals have hard  $\text{CaCO}_3$  exoskeletons
  - Coral animals are relatives of jellyfish
  - Live in symbiosis with algae that carry out photosynthesis



# 4-4 Marine Ecosystems

- Open Ocean
  - Begins at end of continental shelf
  - 500-11,000 meters deep
  - Exposed to high pressure, cold temperatures, total darkness
  - Low productivity, photic zone is responsible for much of the photosynthesis that happens on earth because the oceans are so large

# 4-4 Marine Ecosystems

- Bethnic Zone
- Ocean floor
- Sea stars, anemones, marine worms
- Wait for nutrients produced in the photic zone above to drift down with cold ocean water currents
- Deep sea vents-openings in the earth's crust-chemosynthetic bacteria live there; remember Taq DNA polymerase from *Thermopolis aquaticus*?!