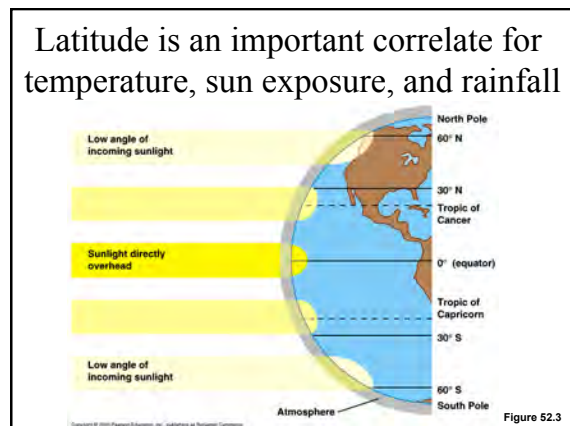
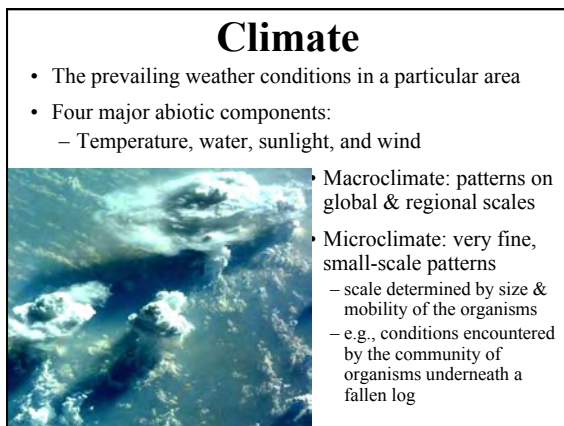
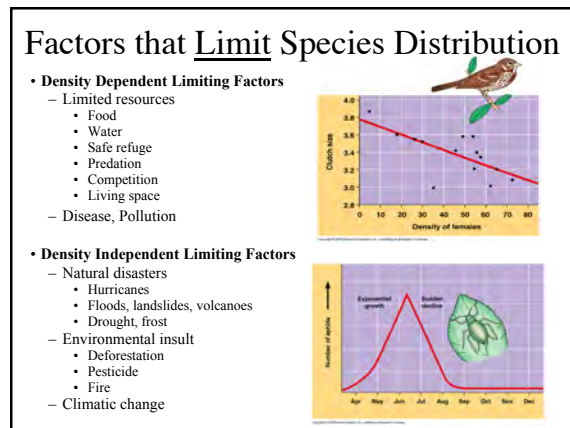
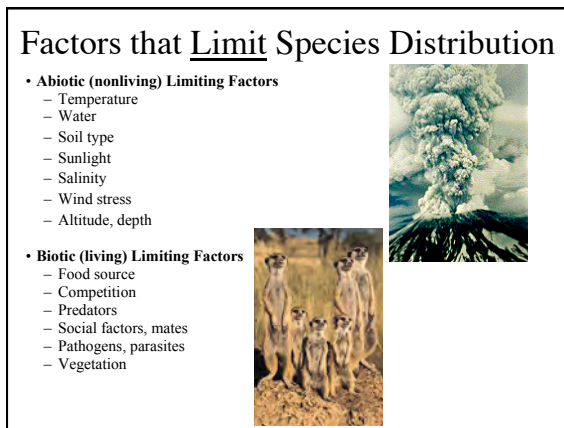
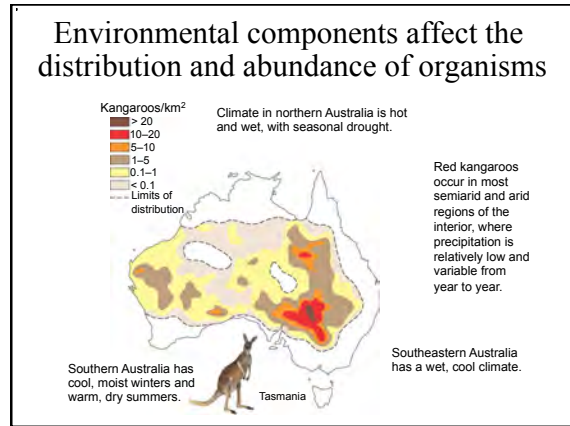
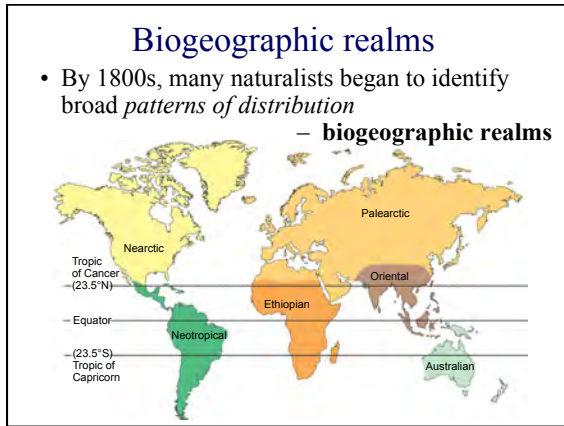
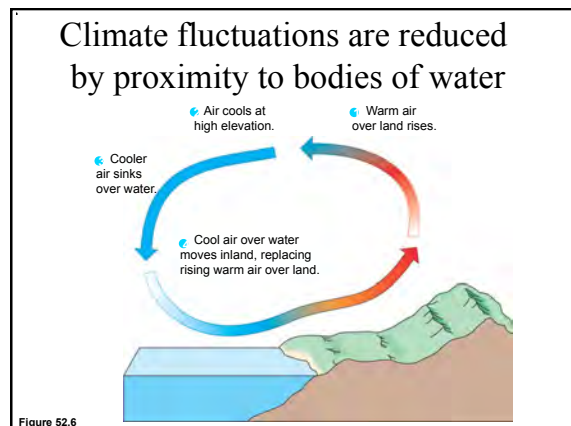
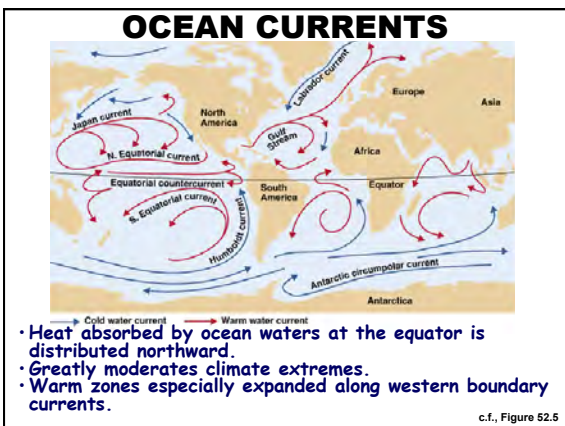
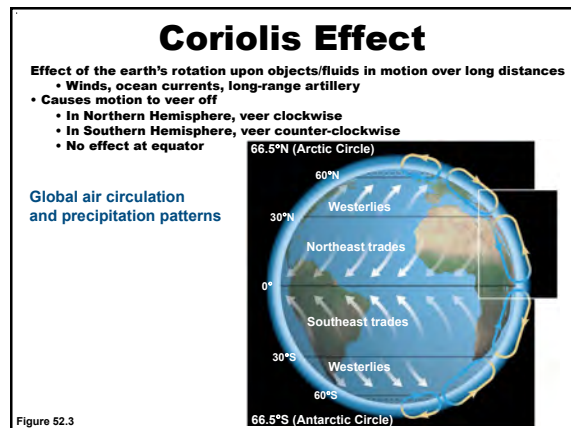
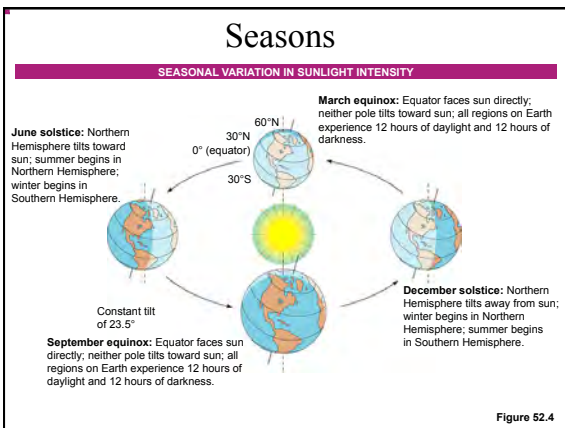
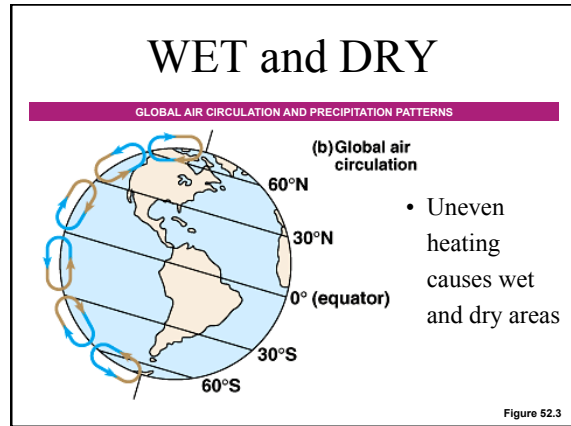
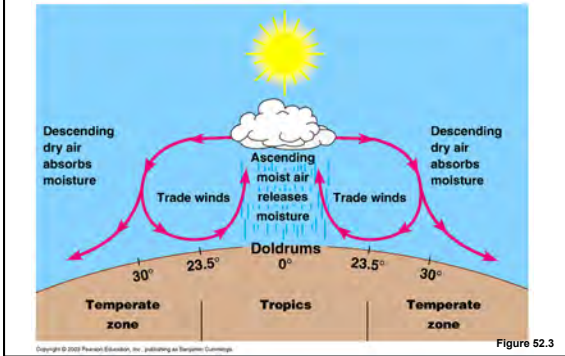


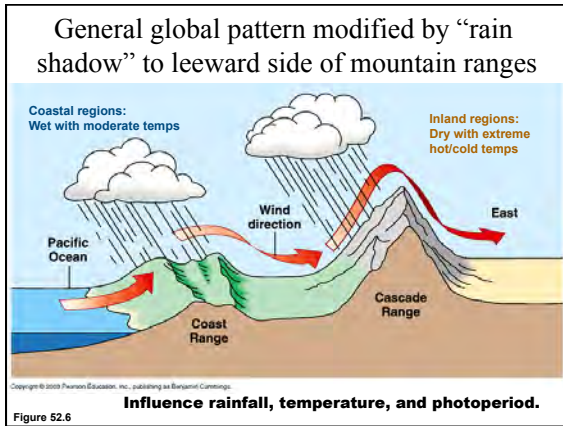
# Climate & Biogeography



# Climate & Biogeography

The equator receives maximal solar heating producing predictable patterns of wind and rainfall

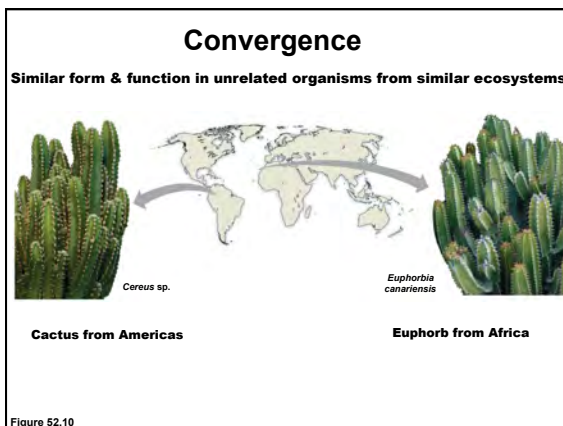
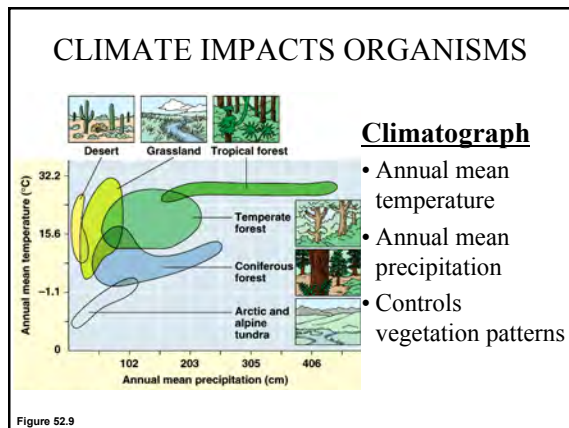
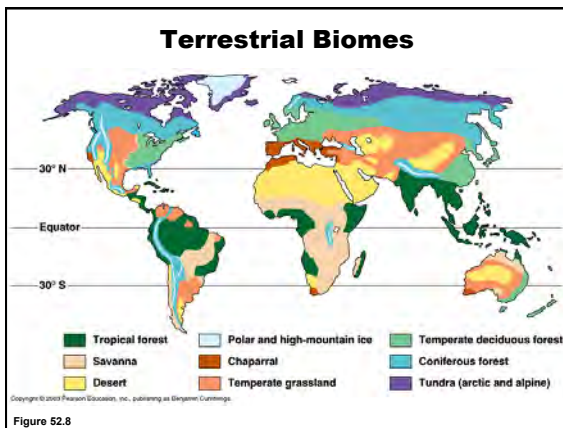




## Biomes: the major types of ecosystems

Terrestrial biomes

- Primary determining factors
  - Temperature (latitude, altitude)
  - Water availability (rainfall)
- Secondary determining factors
  - Substrate (soil type)
  - Photoperiod (latitude again)
  - Wind (evaporative cooling, physical stress)
  - Disturbance (fire, volcano, mudslide, storm, etc.)



## TROPICAL FORESTS

- Warm, stable temperature
- 100+ inches of rain
  - Rain forest: consistent
  - Dry forest: seasonal
- Low nutrient soils
- Rapid decomposition and recycling
- Most complex
  - Patchy & stratified
- High diversity



### SAVANNA BIOME



- Warm temperature
- Low but consistent rainfall
- Less structure and diversity
- Fire and grazing prevent tree invasion

### DESERT BIOME



- Temperature extremes
- Precipitation infrequent
- Evaporation exceeds precipitation
  - Life keyed to rainfall
  - Adaptations for water conservation
- 30° north and south
- Rain shadow

### CHAPARRAL BIOME



- “Mediterranean climate”
- Cool offshore currents
- Mild rainy winters
- Long hot summers
- Frequent fires
- Vegetation adapted to fire

### TEMPERATE GRASSLANDS



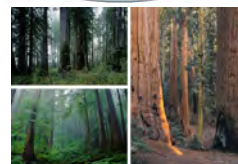
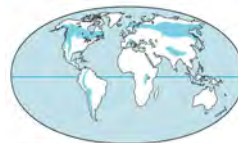
- Cold winters
- Seasonal drought
- Occasional drought
- Grazing and fire
- Prevent invasion by shrubs and trees
- Deep fertile soils
- Human impact

### TEMPERATE DECIDUOUS (BROADLEAF) FOREST



- 35° to 50° north and south
- Ample precipitation
- Warm summers and cold winters
- Deciduous vegetation
- Rich soils
- Many human impacts


### CONIFEROUS FORESTS



#### Largest terrestrial biome

- Short summers
- Harsh winters
- Poor soils
- Cone bearing trees
- Fire maintained
- Temperate rain forests in northwestern North America

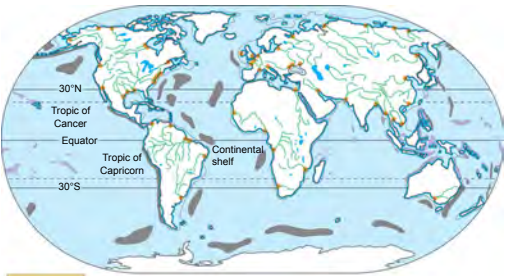
## TUNDRA BIOME



- Northern latitudes
- Alpine regions above treeline
- Short, warm summers
- Long, bitter cold winters
- Permafrost
- Low growing vegetation

## Aquatic Biomes

>75% of Earth's surface

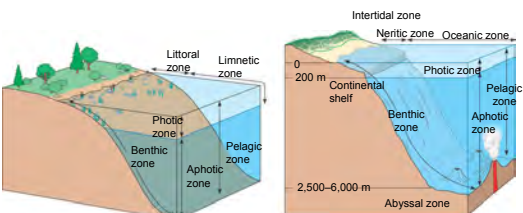


**Key**

- Lakes
- Rivers
- Estuaries
- Abyssal zone (below oceanic pelagic zone)
- Coral reefs
- Oceanic pelagic zone
- Intertidal zone

## Stratification of aquatic biomes

- Many aquatic biomes are stratified into zones (layers) defined by light penetration, temperature, and depth

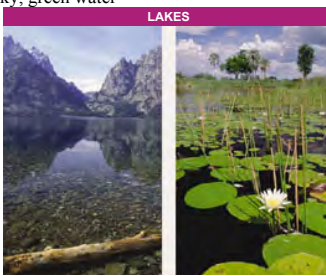


(a) Zonation in a lake. (b) Marine zonation.

**Figure 52.12**

## LAKES

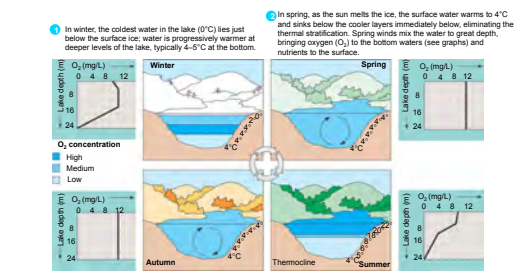
- Oligotrophic: few nutrients → few producers → clear water
- Eutrophic → abundant nutrients → abundant phytoplankton → murky, green water



Oligotrophic lake in Grand Teton, Wyoming      Eutrophic lake in Okavango delta, Botswana

## LAKES


- Lakes are sensitive to seasonal temperature change
  - Often experience seasonal turnover



**Figure 52.13**

## WETLANDS

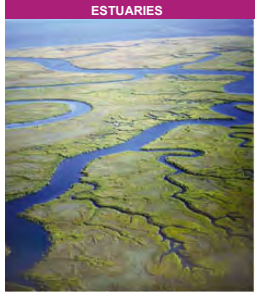
- Alternate between aquatic and terrestrial



Okefenokee National Wetland Reserve in Georgia

## ESTUARIES

- Transition between freshwater and marine

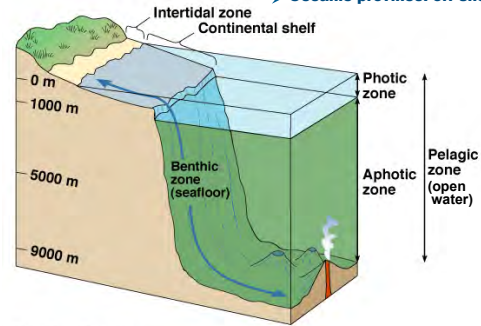


An estuary in a low coastal plain of Georgia

## OCEAN ZONES

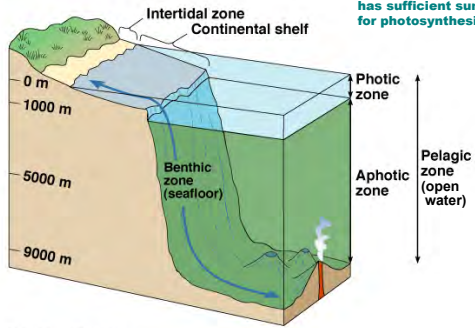
Neritic province: over shelf

Oceanic province: off shore

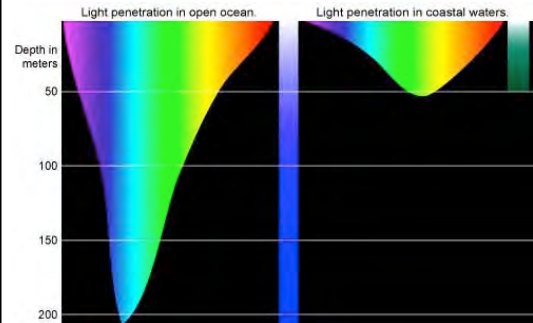


## OCEAN ZONES

Only top 2% of ocean has sufficient sunlight for photosynthesis.



## Light absorption & penetration in the sea



## TROPICAL NERITIC BIOME

- Warm, stratified, oligotrophic waters
- Coral reefs — “oases in the desert”



Coral reef in the Red Sea

## TEMPERATE NERITIC BIOME

- Cold, eutrophic waters → most productive
- Upwelling: surface water blown offshore; replaced by deep water
- Phytoplankton blooms & kelp forests

< 1% of ocean area, but > 50% of fish productivity

Bull kelp



## ABYSSAL BENTHIC BIOME

- Dependent upon organic “marine snow” raining down from euphotic surface waters
- Isolated pockets of chemoautotrophs



A deep-sea hydrothermal vent community

## OCEANIC BIOME

Earth's largest ecosystem! (>90% of biosphere)

