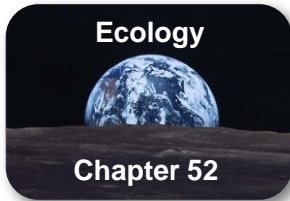


"Look again at that dot... That's here. That's home. That's us. On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives."



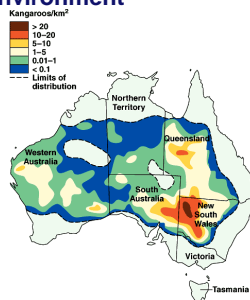
Carl Sagan
—Pale Blue Dot

Spheres of Life

- Molecules
- Cells
- (Tissues → Organ → Organ systems)
- Organisms
- Populations
- Community
 - ◆ all the organisms of all the species that inhabit a particular area
- **Ecosystem**
- Biosphere

Ecology

- Scientific study of interactions between organisms & their environment
 - ◆ these interactions determine the distribution & abundance of organisms



Impact of Ecology as a Science

- Ecology provides a scientific context for evaluating environmental issues
 - ◆ **Rachel Carson**, in her book, *Silent Spring*, warned that use of pesticides such as DDT was causing population declines in many non-target organisms



Environmental Factors

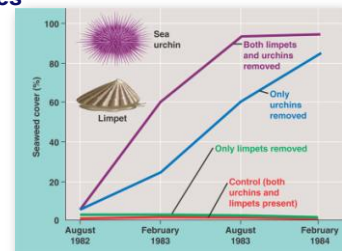
- Biotic factors
 - ◆ living components
 - animals
 - plants
- Abiotic factors
 - ◆ non-living chemical & physical factors
 - temperature
 - light
 - water
 - nutrients



Biotic Factors


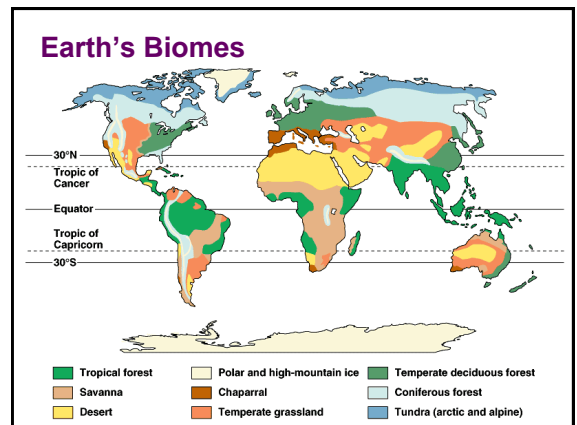
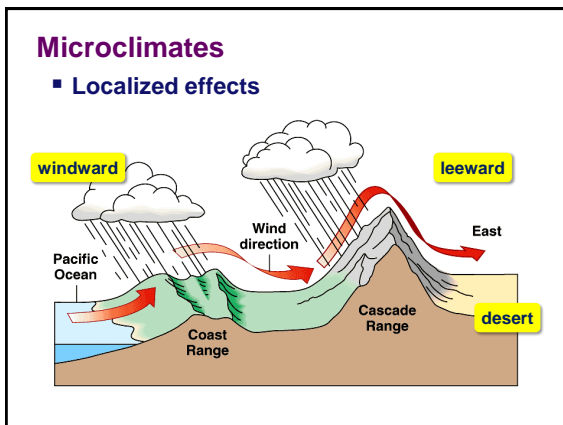
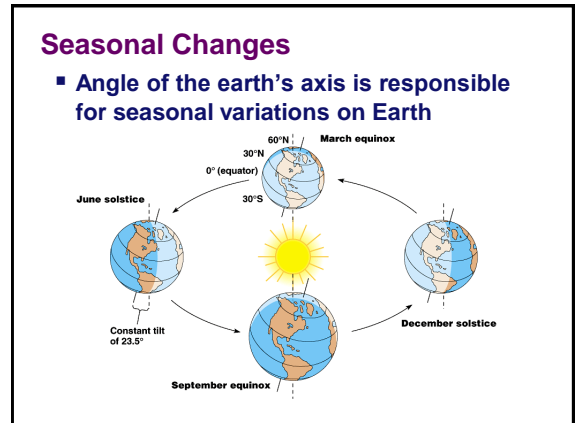
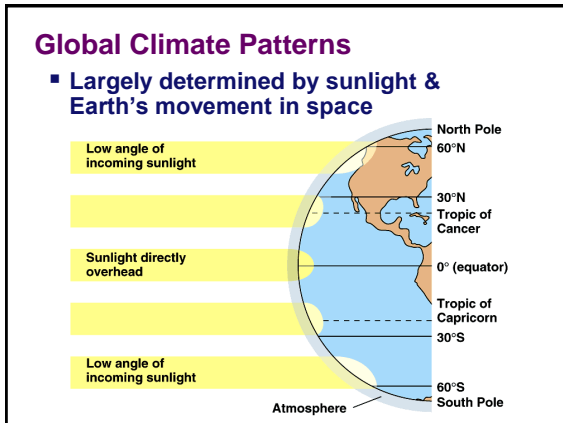
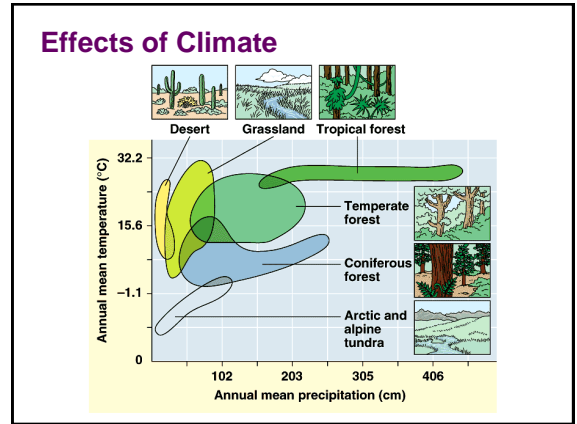
- Competitors
- Predators / Parasites
- Food sources

% seaweed & role of 2 herbivores



Abiotic Factors

- **Climate**
 - ◆ prevailing weather conditions in an area
 - temperature
 - water
 - sunlight
 - wind
 - rocks & soil
- **Physical factors**
 - ◆ rocks & soil

Arctic Tundra



distribution: arctic, high-latitude, northern hemisphere
precipitation: dry
temperature: cold year round
characteristics: permafrost, lichens & mosses, migrating animals & resident herbivores

Alpine Tundra



distribution: high elevation at all latitudes
precipitation: dry
temperature: cold year round
characteristics: permafrost, lichens, mosses, grasses; migrating animals & resident herbivores

Coniferous Forest (Taiga)



distribution: high-latitude, northern hemisphere
precipitation: adequate to dry
temperature: cool year round
characteristics: conifers; diverse mammals, birds, insects, etc.

Temperate Deciduous Forest



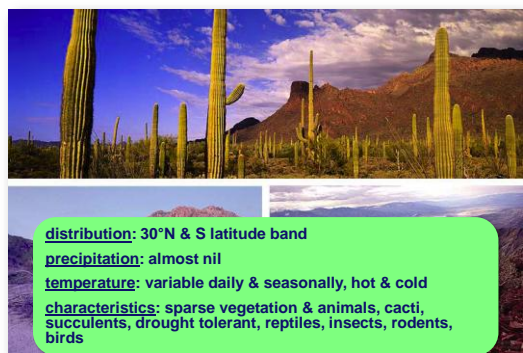
distribution: mid-latitude, northern hemisphere
precipitation: adequate, summer rains, winter snow
temperature: moderate warm summer/cool winter
characteristics: many mammals, insects, birds, etc.; deciduous trees; fertile soils

Temperate Grassland



distribution: mid-latitudes, mid-continents
precipitation: seasonal, dry season/wet season
temperature: cold winters/hot summers
characteristics: prairie grasses, fire-adapted, drought tolerant plants; many herbivores; deep, fertile soil

Desert



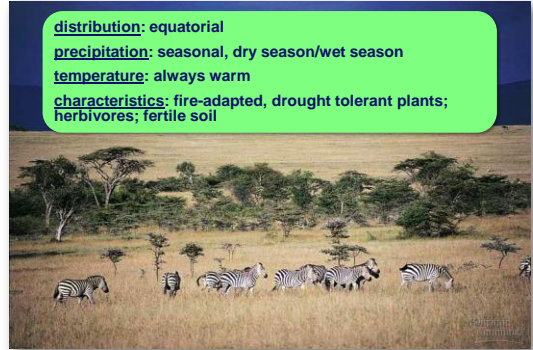
distribution: 30°N & S latitude band
precipitation: almost nil
temperature: variable daily & seasonally, hot & cold
characteristics: sparse vegetation & animals, cacti, succulents, drought tolerant, reptiles, insects, rodents, birds

Chaparral



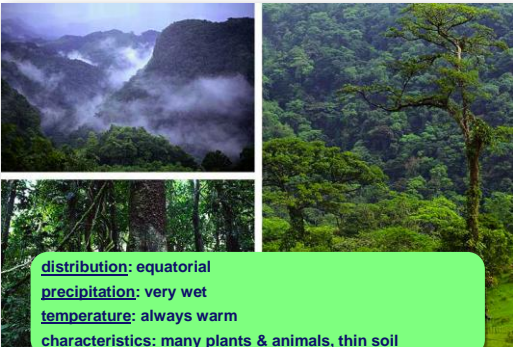
distribution: coastal mid-latitude
precipitation: seasonal, dry summer/rainy winter
temperature: hot summer/cool winter
characteristics: scrubby vegetation, drought-adapted, fire-adapted, herbivores, amphibians, birds, insects

Savanna



distribution: equatorial
precipitation: seasonal, dry season/wet season
temperature: always warm
characteristics: fire-adapted, drought tolerant plants; herbivores; fertile soil

Tropical Rainforest



distribution: equatorial
precipitation: very wet
temperature: always warm
characteristics: many plants & animals, thin soil

Fresh Water

- Lakes
 - ◆ Oligotrophic
 - nutrient poor
 - ◆ Eutrophic
 - nutrient rich
- Rivers
 - ◆ different community supported than in ponds & lakes



Marine



Biogeography

- Geographical distribution of species
 - ◆ species **living in the same region** tend to be more closely related to each other



Biogeography

- Geographical distribution of species
 - species which look similar but are **from different regions** are often **NOT closely related**

marsupial mammals **placental mammals**

Convergent Evolution

- Parallel, but separate, evolutionary paths
 - filling similar ecological roles in similar environments, so similar adaptations were selected

marsupial mammals **placental mammals**

Wallace's Line

- an imaginary line drawn through the Malay Archipelago that divides each half on distributions of plant and animal species
- over a channel deep enough not to have been covered by land during the Pleistocene glaciations

major biogeographical regions

Phylogenetic Taxonomy

Taxonomic phylogeny

- Ancestral horse
- Prozewski's horse
- Charger
- African zebra
- Mountain zebra
- Grevy's zebra
- Plains zebra

Area phylogeny

- Origin in North America
- Central Asia
- Middle East and Central Asia
- North Africa
- South West Africa
- East Africa
- Eastern and Southern Africa

Speciation of zebrae has taken place entirely in Africa.

Horses speciated as they moved from Asia to Africa.

3.9 3 2 1 0
Millions of years ago (mya)

Vicariance and Dispersal

- both affect distribution of species
- Vicariant Event** (geographic isolation)
 - the appearance of a physical barrier that splits the range of a species
 - land bridge disappearing
 - new river/waterway via flooding
 - fire path/lava path
- Biotic Interchange**
 - fusion of land masses where species inhabit new areas
 - North and South American fauna

simulation of Island Biogeography

simulation of Island Biogeography

Dasypus novemcinctus *Erethizon dorsatum*

Pseudalopex griseus *Catagorpus wagneri* *Vicugna vicugna*