Ecology

Bio 11
Terms

- Community - all the organisms acting together in an ecosystem.
- Species diversity
- Dominant species - not always the most abundant
- Response to disturbance
- Trophic structure - feeding relationships
Terms

- Interspecific competition - the growth of one may inhibit the other
- Carrying capacity
- Competitive exclusion principle - one species out competes the other.
Competitive exclusion Principle
Terms

- Niche
- Resource partitioning - similar species co-exist.
- Adaptive radiation
Resource Partitioning

- A. ricordii
- A. insolitus
- A. aliniger
- A. christophei
- A. distichus
- A. cybotes
- A. etheridgei

A. insolitus perches on shady branches.

A. distichus perches on sunny surfaces.
Terms

- Predator
- Prey
- Both have adaptations to ensure survival
- Camouflage
- Mechanical defenses
- Chemical defences
- Mimicry
Chemical defense - brightly colored
Batesian mimicry
Mullerian mimicry
Predators can also use mimicry

- turtles
Keystone species
Keystone predator
Plants also have defenses

- Chemical toxins
- Thorns and spines
- Chemicals that cause abnormal development.
Coevolution
terms

• Symbiotic relationship
• Parasitism
• Commensalism
• Mutualism
Paristism
Mutualism
Terms

- Disturbances
- Ecological succession
- Primary succession
- Secondary succession
Primary and secondary succession end at the same place

- Retreating glacier with moraine in the foreground
- Dryas stage
- Spruce starting to appear in the alder and cottonwood forest
- Spruce and hemlock forest
Terms

- Food chain and food webs
- Producers
- Primary consumers
- Secondary consumers
- Tertiary consumers
- Quaternary consumers
- Detritivores or decomposers
Food chain

Trophic level

Quaternary consumers
Hawk
Killer whale

Tertiary consumers
Snake
Tuna

Secondary consumers
Mouse
Herring

Primary consumers
Greenthopper
Zooplankton

Producers
Plant
Phytoplankton

A terrestrial food chain
An aquatic food chain
Food web
Ecosystem

- Biotic
- Abiotic
- Energy flow
- Chemical cycling
ecosystem
Energy budget

- $10^{19}$ kcals of solar energy hit the planet
- 1% is converted to chemical energy by photosynthesis
- This supports the biomass
- Organisms involved in this process are primary producers.
- Productivity differs greatly with ecosystems.
Primary productivity

- Open ocean
- Estuary
- Algal beds and coral reefs
- Desert and semidesert scrub
- Tundra
- Temperate grassland
- Cultivated land
- Boreal forest (taiga)
- Savanna
- Temperate deciduous forest
- Tropical rain forest

Average net primary productivity (g/m²/yr)
Pyramid of production

- **Producers**: 10,000 kcal
- **Primary consumers**: 1,000 kcal
- **Secondary consumers**: 100 kcal
- **Tertiary consumers**: 10 kcal

1,000,000 kcal of sunlight
Cycling of matter

1. Producers
2. Detritivores
3. Consumers
4. Nutrients available to producers

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Cycling of water

Diagram showing the water cycle:
- Solar energy
- Net movement of water vapor by wind
- Precipitation over ocean
- Evaporation from ocean
- Evaporation and transpiration from land
- Precipitation over land
- Percolation through soil
- Runoff and groundwater
- Transport over land
Carbon cycle

- **CO₂ in atmosphere**
- **Photosynthesis**
- **Cellular respiration**
- **Rusting of fossil fuels and wood**
- **Carbon compounds in water**
- **Detritus**
- **Decomposition**

Primary consumers -> Higher-level consumers
Phosphorus cycle

- Geologic uplift of rocks
- Weathering of rocks
- Runoff
- Plant uptake of $PO_4^{3-}$
- Soil
- Decomposition
- Sedimentation
- Consumption
Biodiversity

- Endangered species
- Threatened species
- Loss of biodiversity -- and potential cures
- Loss of wetlands
Threats to biodiversity

- Introduction of new species
- Overexploitation
Pollution in the environment

• Biological magnification
Biological magnification

- Herring gull eggs: 124 ppm
- Lake trout: 4.03 ppm
- Smelt: 1.04 ppm
- Zooplankton: 0.123 ppm
- Phytoplankton: 0.025 ppm
Global warming
Global warming

Global warming: CO₂ lets sunlight through but retains the heat radiated from Earth.

CO₂ in the atmosphere

Human activities and natural processes add CO₂ to the atmosphere, increasing the effect.

Photosynthesis removes CO₂ from the atmosphere, decreasing the effect.
Victim of global warming
Small population

- Problems with genetic drift
- Extinction vortex
- Fragmented ecosystems
Spotted owls fragmented ecosystem
Identifying critical habitat factors
Ideal habitat
Controlled burn to restore habitat
Landscape ecology
Terms

- Biodiversity hotspots
- Endemic species
Earth’s biodiversity hotspots
Gray wolf
Y2Y plan
Terms

- Restoration ecology
- Bioremediation
- Biological augmentation
Zoned reserves

[Map showing zoned reserves in Central America, with shaded regions indicating national parkland and buffer zones]