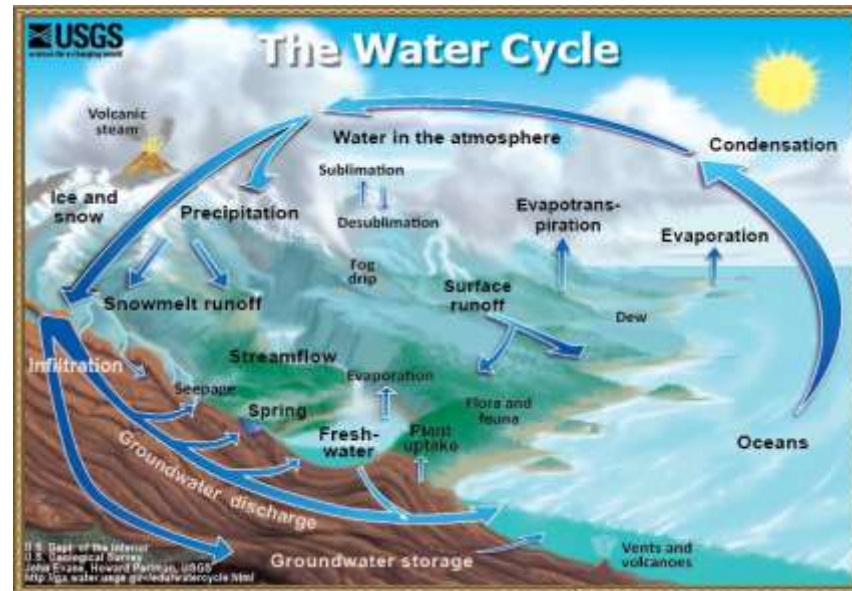
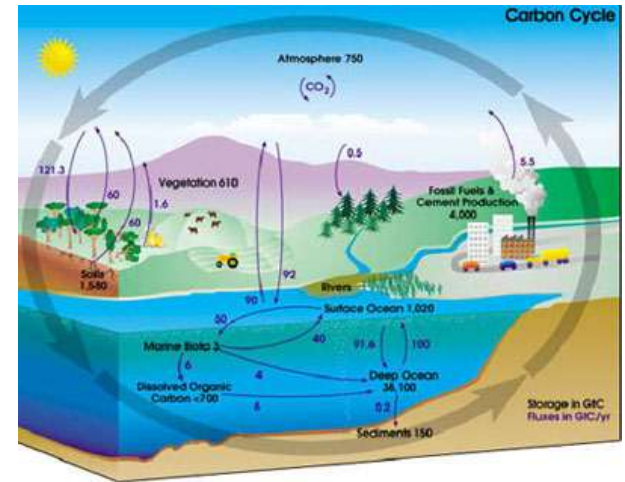




- *Ecosystems*

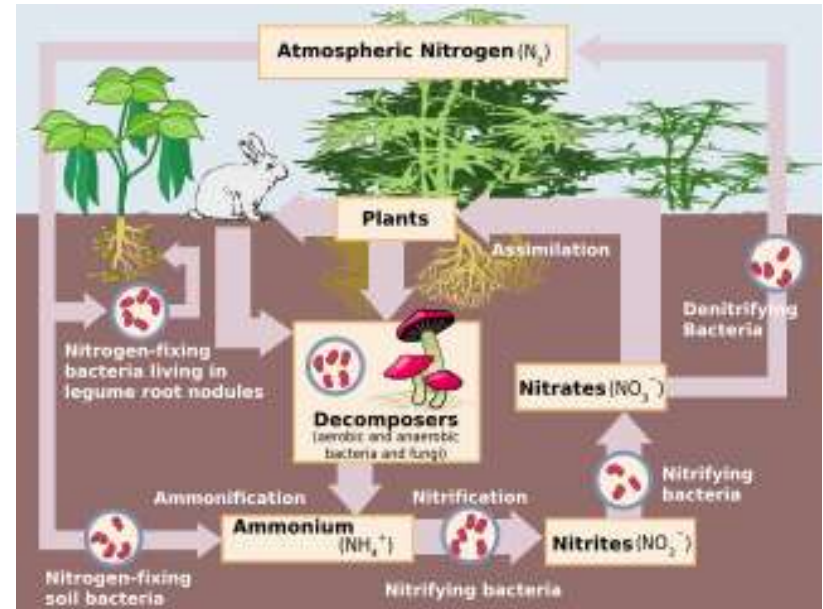
Chemical Cycling

- **Biogeochemical cycles: the various nutrient circuits, which involve both abiotic and biotic components of an ecosystem**
- **Water**
- **Carbon**
- **Nitrogen**
- **Phosphorus**



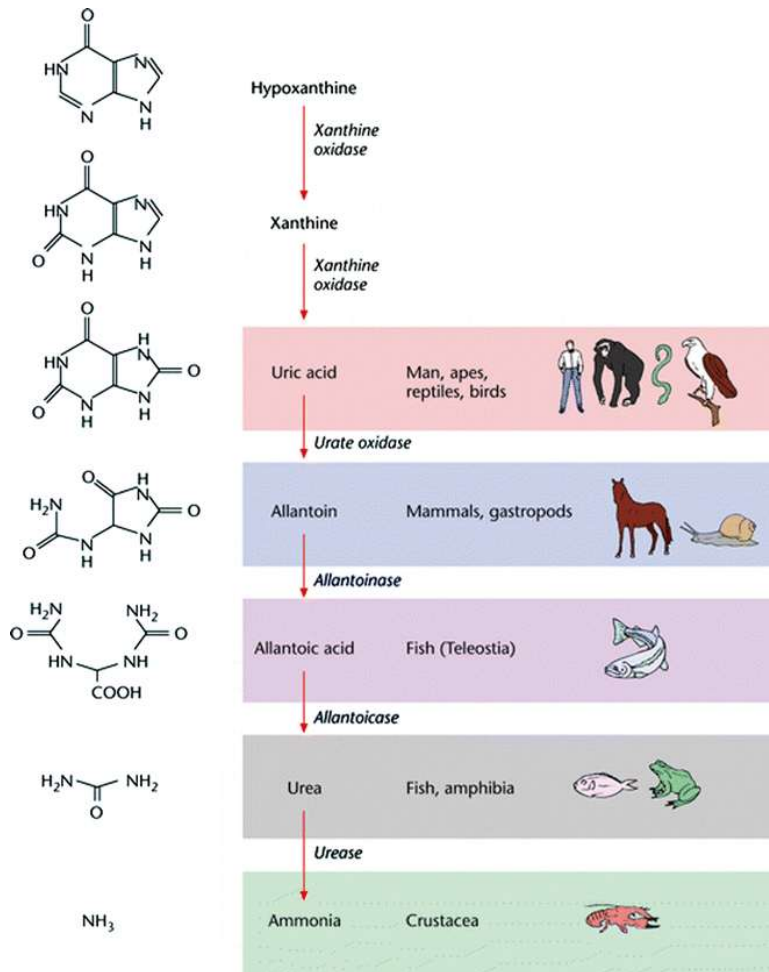
Nitrogen cycle

- Atmospheric nitrogen is inert (diatomic triple bonded)
- Without nitrogen fixing bacteria we would not have nitrogen available for our use
- These bacteria live in symbiosis in nodules on the roots of legumes



Nitrogen based fertilizers are often used to enhance the soil for farming

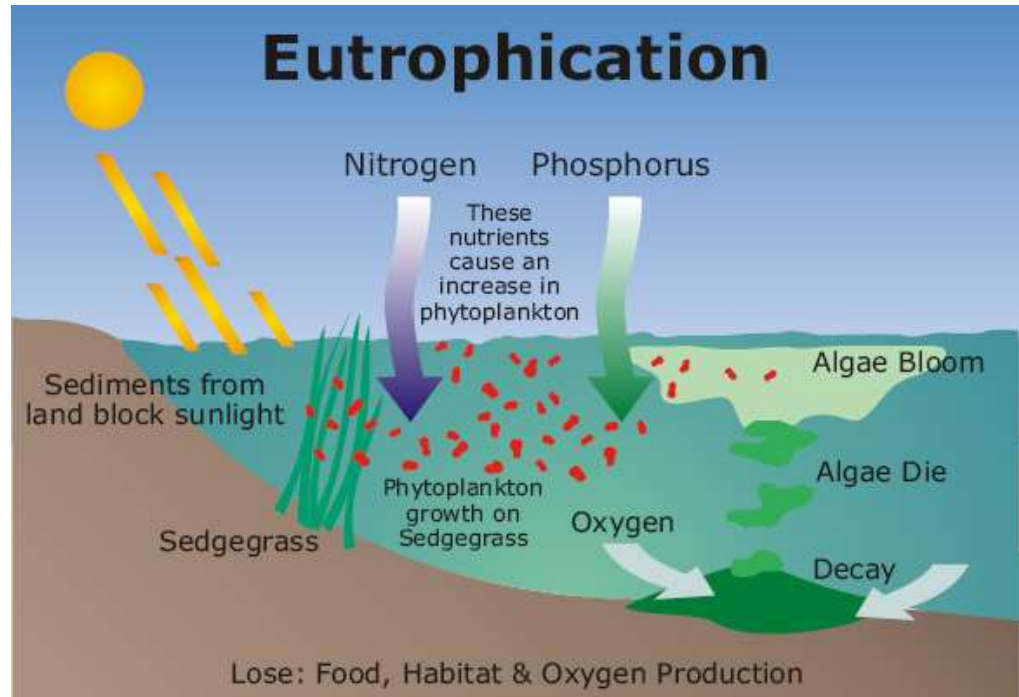
Elimination of Nitrogenous Waste



- Bony fish excrete **ammonia** directly through diffusion
- Birds reptiles and insects excrete **uric acid** in the form of pasty guano which crystallizes in the egg
- Mammals filter **urea** through the nephron of the kidney

Eutrophication

- Addition of excess nitrogen and phosphorus into the soil can lead to run-off
- These elements can speed growth of producers in nearby aquatic ecosystems.



QOD #5

- Explain how matter and energy differ in an ecosystem

Energy and Matter

- Matter Cycles
- Energy does not
- Energy needs to keep coming in from the sun if we are to survive



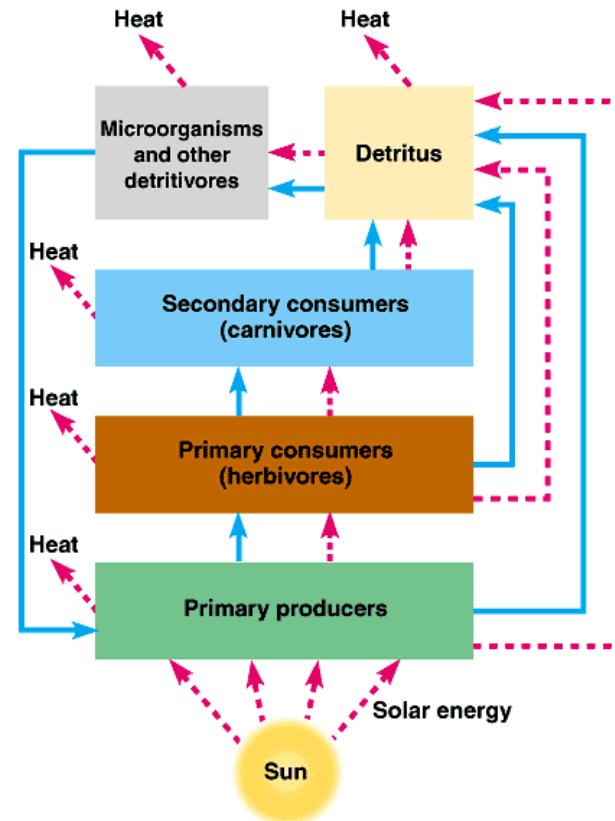
The Second Law of Thermodynamics



- Although energy can change forms, the amount of useful energy always decreases.
- Energy is constantly lost as entropy (disorder)
- How then can life continue to evolve and still follow this law?

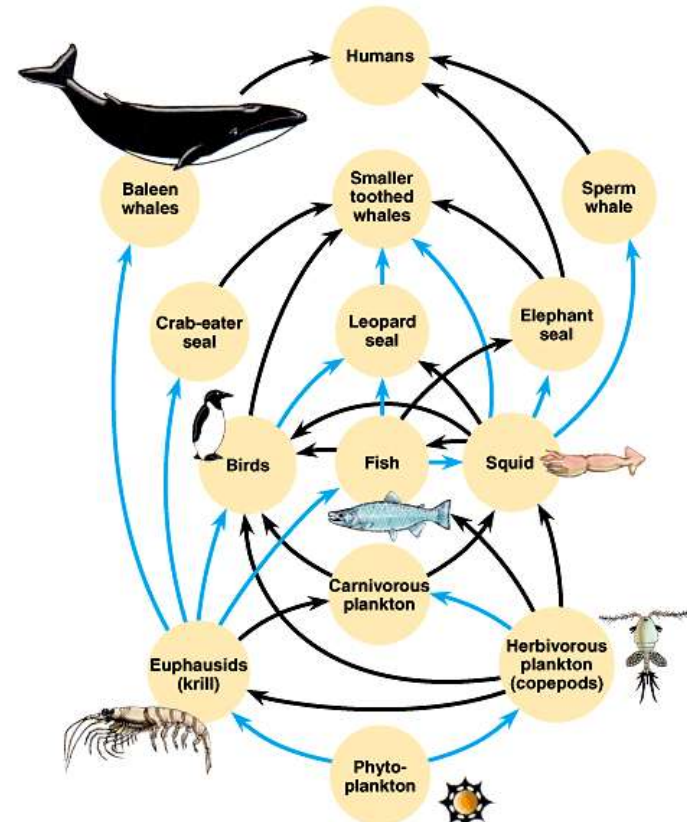
Food Chains

- Trophic structure / levels~ feeding relationships in an ecosystem
- Primary producers~ the trophic level that supports all others; autotrophs
- Primary consumers~ herbivores
- Secondary and tertiary consumers~ carnivores
- Detrivores/detritus~ special consumers that derive nutrition from non-living organic matter
- Food chain~ trophic level food pathway



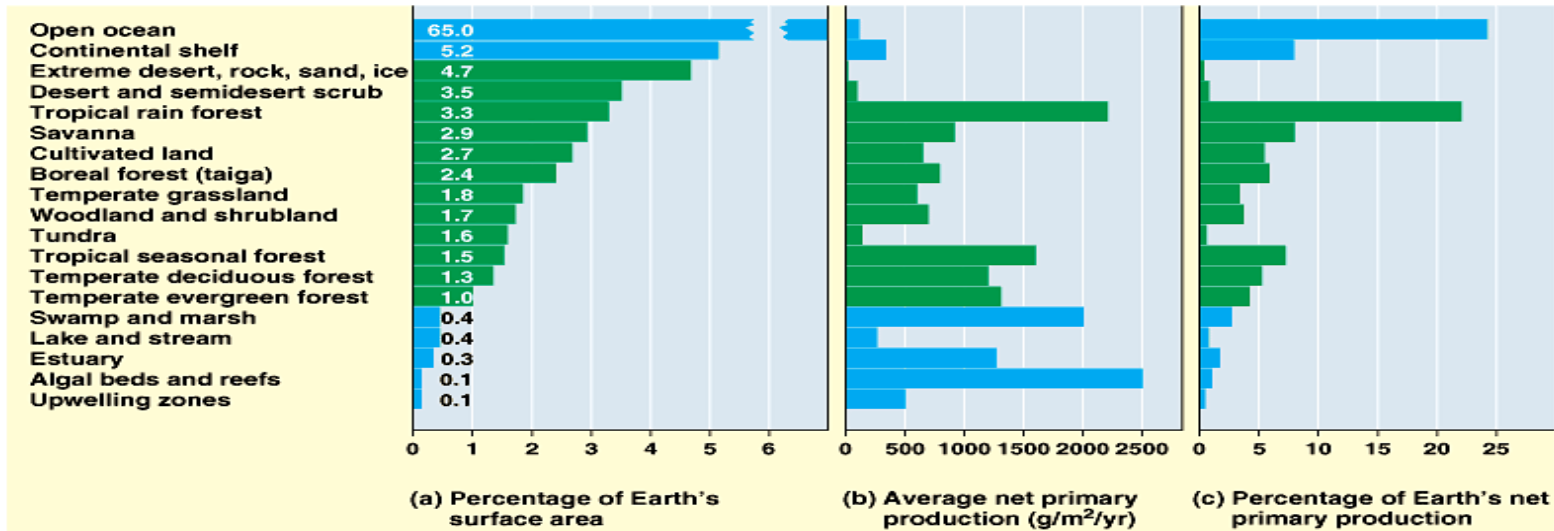
Food Webs

- **Food webs**~ interconnected feeding relationship in an ecosystem



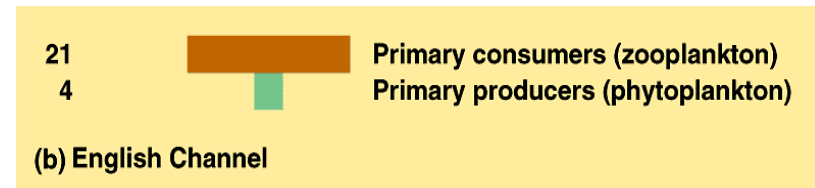
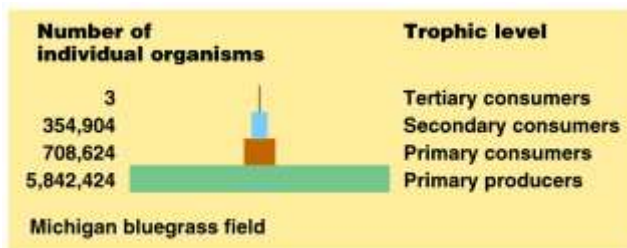
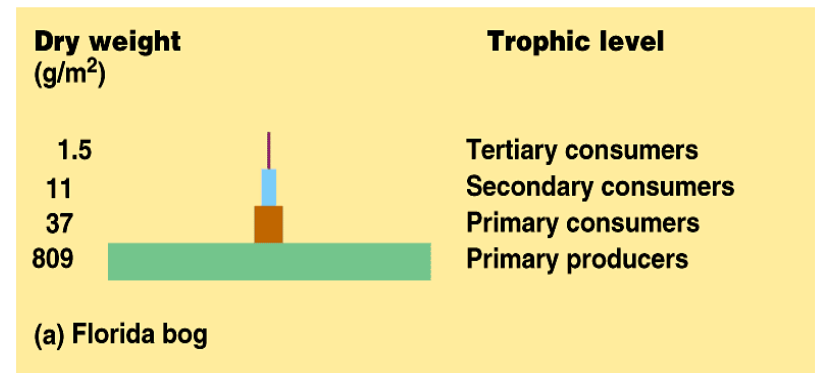
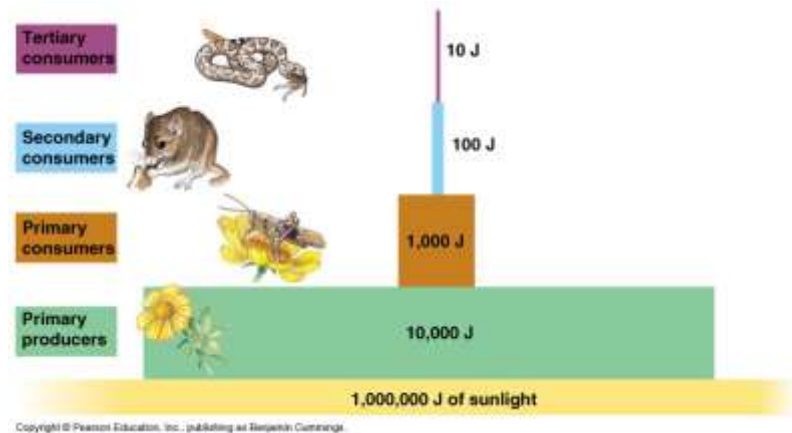
Energy Flow, I

- Primary productivity (amount of light energy converted to chemical energy by autotrophs)
 - Gross (GPP): total energy
 - Net (NPP): represents the storage of energy available to consumers
 - Rs: respiration
- $NPP = GPP - R_s$
- Biomass: primary productivity reflected as dry weight of organic material
- Secondary productivity: the rate at which an ecosystem's consumers convert chemical energy of the food they eat into their own new biomass



Energy Flow, II

- **Ecological efficiency:** % of E transferred from one trophic level to the next (5-20%)
- **Pyramid of productivity:** multiplicative loss of energy in trophic levels
- **Biomass pyramid:** trophic representation of biomass in ecosystems
- **Pyramid of numbers:** trophic representation of the number of organisms in an ecosystem



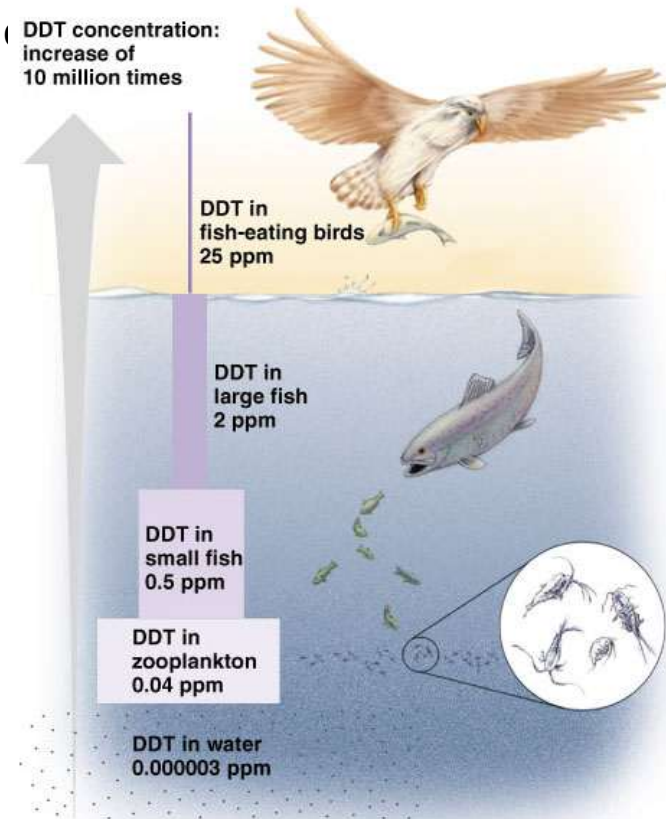
Questions to Consider

- What does an organism do if it has excess free energy?
- What does an organism do if it has insufficient free energy?
- How does a population react to excess free energy?
- How does a population react to insufficient free energy?

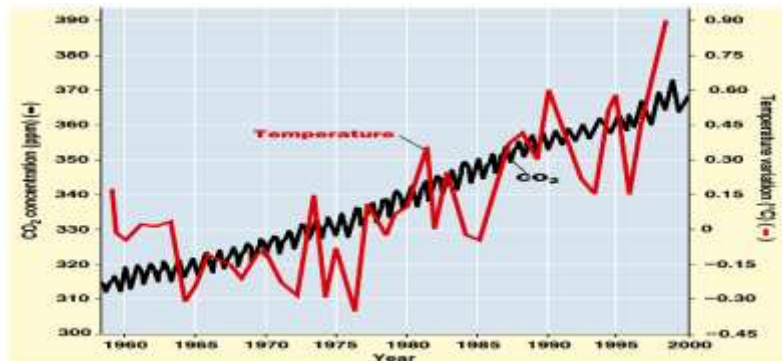


Human Impact

- **Biological magnification:** trophic process in which retained substances become more concentrated at higher levels
- **Greenhouse effect:** warming of planet due to atmospheric accumulation of carbon dioxide
- **Ozone depletion:** effect of chlorofluorocarbons (CFC's) released into the atmosphere
- **Rainforest destruction**
- **Cause: Overpopulation?**



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

A Biome Disruption Project

- You may choose to make:
 - A poster
 - A comic
 - A story
- You may work:
 - Alone
 - In groups of 2
 - In a group of 3
- You should include
 - Biome homeostasis description:
 - Climate
 - Temperature
 - Location
 - Biotic factors:
 - Organisms within a complete food chain (include decomposers)
 - A disruption to homeostasis
 - A recovery

Succession of an Ecosystem Poster

- Use words and pictures to demonstrate how a chosen ecosystem changes over time.

- 5 panels that show specific stages of evolution
- Include a disturbance followed by secondary succession
- one producer, two consumers, three abiotics
- A brief description of each stage

