Ecosystem Dynamics

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Energy

Between 5 and 30 percent of energy in tissues of organisms at one trophic level ends up in tissues of those at the next trophic level:
- Some energy is lost as heat
- Some biomass is not digested

Transfers efficiency tends to be greatest in aquatic systems (less lignin, more ectotherms)

Nutrients

Elements essential to life (nutrients)
- Oxygen
- Hydrogen
- Carbon
- Nitrogen
- Phosphorus

Nutrients are cycled
- Producers take up inorganic compounds from the environment; decomposers return them.

Biomagnification

Some harmful substances, such as DDT, become increasingly concentrated in tissues of organisms as they move up the food chain.

Mercury – not a nutrient, a contaminant.

- Mercury from coal-burning power plants, mines and industries washes into aquatic habitats.
- Mercury accumulates in fish top carnivores, and people who eat them.
- Mercury damages developing human nervous systems; children and women who are pregnant or nursing should avoid eating contaminated fish.
**Biogeochemical Cycles**

Nutrients move from inorganic reservoirs (rocks, sediments, water, atmosphere) to living systems through primary producers.

- Water
- Carbon
- Nitrogen
- Phosphorus

For each you need to know source, destinations & What happens if disrupted.

**Demonstration I. Hydrologic Cycle**

- Contamination / pollution of drinking water.
- Flooding events, especially in areas that have had their vegetation removed e.g. deforestation.
- Over consumption e.g. irrigation in arid climates, leads to depleted aquifers.
- Water can be carrier for diseases such as giardia, dysentery, cholera etc.. The U.N. estimates that impure water causes 80% of diseases in the developing world.

**Imbalances in the Hydrologic Cycle**

**Demonstration II. Phosphorous Cycle**

Contributes most significantly to nutrient loading of fresh water ecosystems.

Results from:
- Pollution runoff from excessive use of fertilizers.
- Detergents and other household products containing phosphates.

**Imbalances in the Phosphorous Cycle**

Nutrient enrichment of any ecosystem that is otherwise low in nutrients; often a form of nutrient pollution from agricultural runoff or sewage

Eutrophication of a lake can cause
- excessive algal growth
- oxygen depletion
- fish kills
Phosphates tend to be a limiting factor in aquatic ecosystems. What is their source if in excess? Anthropogenic i.e. humans

To much of a good thing…

- Fertilizer running off the land produces algal blooms (or red tides) – overpopulation of microorganisms.
- Algal blooms reduce the oxygen content of water.
- Red tides can threaten large coastal areas (Texas).

Humans are disrupting natural biogeochemical cycles!

1. New, man-made compounds are released into the environment – some with harmful consequences!
2. Nutrients are displaced – moved from one location to another.
3. Excessive compounds (pollutants) are added to air, water, and soil.