Ecosystems and Biogeochemical Cycling

ECOL 206

January 24, 2007

Upcoming Events of Interest

SNR Seminar: "Tigers forever: a Wildlife Conservation Society initiative ensuring that tigers live in the wild forever"

Andrea Heydlauff, Wildlife Conservation Society

TODAY at Noon

Biosciences East 225

EEB Seminar: "Microbial enzymes and communities under environmental change: Implications for ecosystem processes"

Steven Allison, UC Irvine

Monday, January 29, 4:00 pm

Biosciences West 301

Free Screening of "An Inconvenient Truth" with a Panel Discussion by UA Climate Scientists (ISPE)

Wednesday, January 31, noon

Gallagher Theater, Student Union

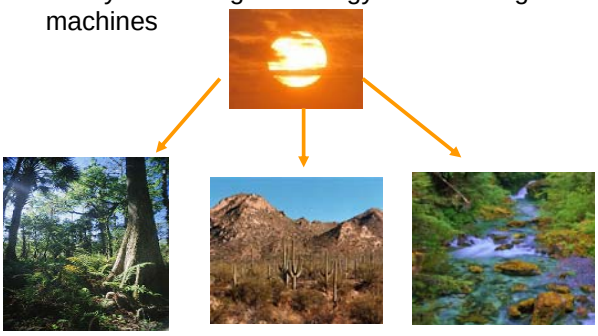
Not eligible for Current Events assignment!

Current Events Assignments

- Appropriate sources
- Full citation, not just web address
- Written assignment – Use correct grammar and good sentence structure
- On time
- Summarize article
- Respond to the article

Ecosystem Ecology

- Ecosystems as giant energy-transforming machines

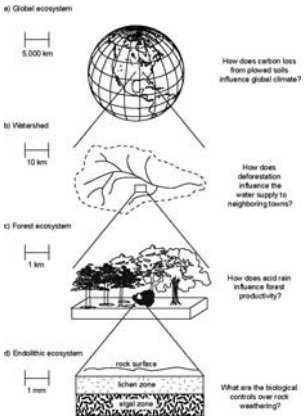


Ecosystem Components

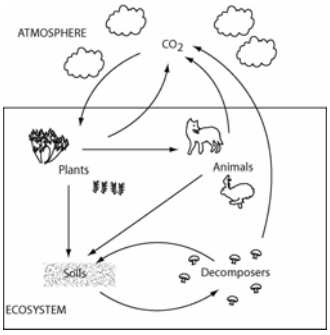
- Biotic Components
  - Autotrophs (inorganic to organic – reduce carbon compounds – fix energy – chemical or light)
  - Heterotrophs (rely on autotrophs or organic matter – macroconsumers (phagotrophs) – microconsumers (saprotrophs – decomposers)
- Abiotic Components
  - Inorganic molecules (C,H,N,P,S,Fe,Si,O – CO_2, H_2O)
  - Organic molecules (humus, non-bound carbon based molecules)
  - Substrate (parent material and age)
  - Climate (light, temp, precip)

Ecosystems

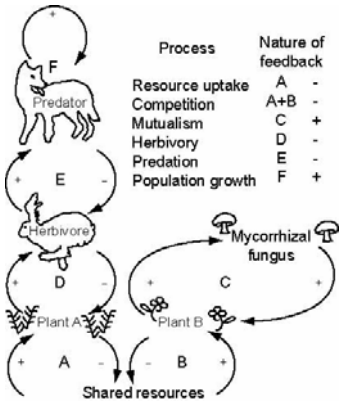
Ecosystems can range from a microcosm, such as an aquarium to a large area such as a lake or forest

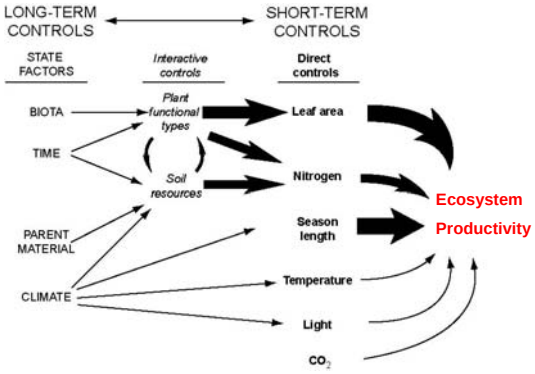


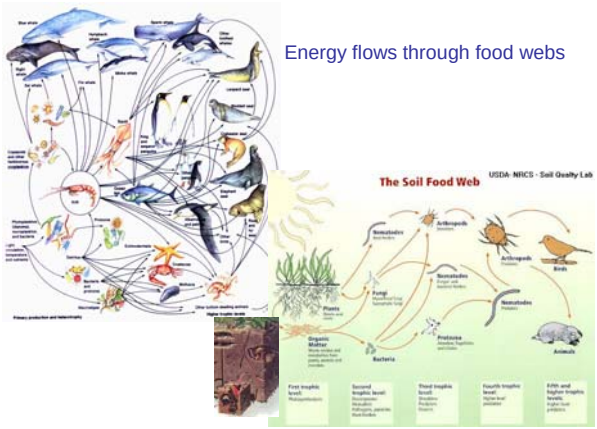
Simple ecosystem model



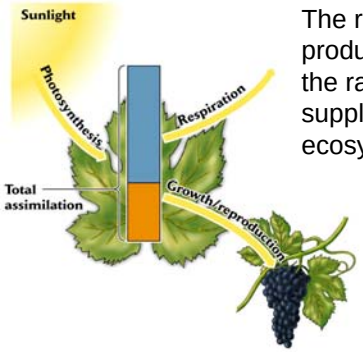
Ecosystem Science is concerned with resource pools, cycles, and feedbacks that regulate process rates and status







Energy flows through food webs



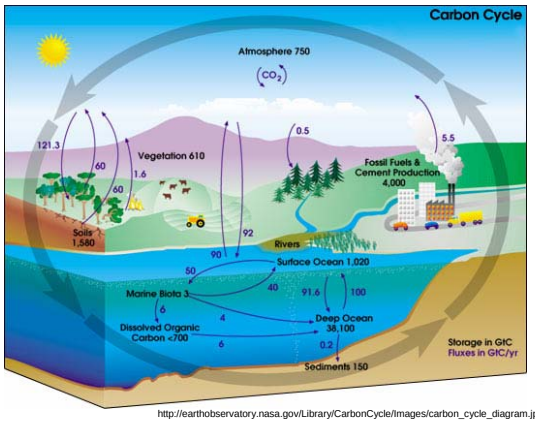
The rate of primary production determines the rate of energy supply to the rest of the ecosystem

Components of Primary Production

- **Gross primary production (GPP)** = total energy assimilated by primary producers
- **Net primary production (NPP)** = energy accumulated (in stored form) by primary producers
- Gross - net = **respiration (R)**, the energy consumed by producers for maintenance and biosynthesis

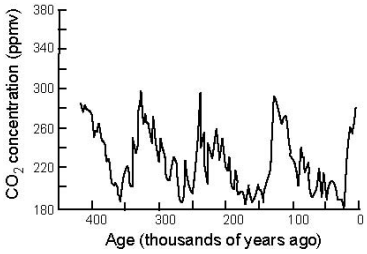
Ecosystems support **two parallel food chains**:

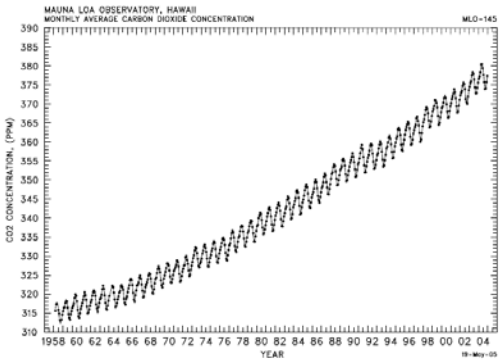
- **Herbivore-based** (large animals feed on leaves, fruits, seeds)
- **Detritus-based** (microorganisms and small animals consume dead remains of plants and indigestible excreta of herbivores)
- herbivores consume:
  - 1.5-2.5% of net primary production in temperate forests
  - 12% in old-field habitats
  - 60-99% in plankton communities



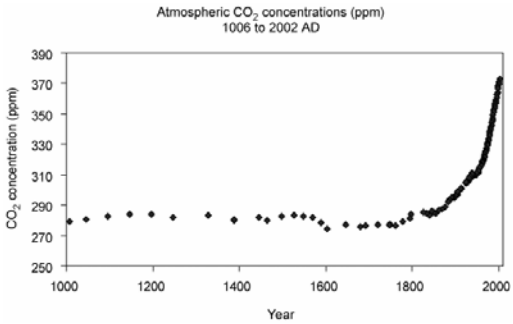
http://earthobservatory.nasa.gov/Library/CarbonCycle/Images/carbon_cycle_diagram.jpg

Atmospheric CO_2 Concentrations





Keeling, C.D. and T.P. Whorf. 2005. Atmospheric CO2 records from sites in the SIO air sampling network. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.



http://www.deh.gov.au/biodiversity/publications/greenhouse/images/figure2-1.gif,
(data from Petit et al. 1999 Nature)

Does elevated CO_2 affect you?