



Ecosystem ecology
A more complete picture

Community + Abiotic

- Ecosystems are...
- Focus is on energy flow and nutrient cycling



Fig. 55.2

Ecosystem dynamics

- Energy (carbon) flow
- Nutrient cycling (esp. N & P)

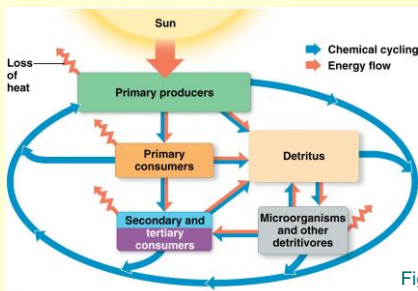


Fig. 55.4

Why is an ecosystem approach so effective?

- Ecosystems follow the laws of physics
- **First law** (conservation of energy) means you can trace energy flow throughout an ecosystem and calculate energy budgets
- **Second law** (entropy) means energy is 'lost' as heat and waste so less energy is available to higher trophic levels; efficiency is important!

Primary production

- The base of the food web
- **GPP** = all the light energy converted into chemical energy by photosynthesis per unit time
- **NPP** = $GPP - R$
 - The amount of energy available to ...



Global NPP visualized

- Lots of variation...what limits NPP?

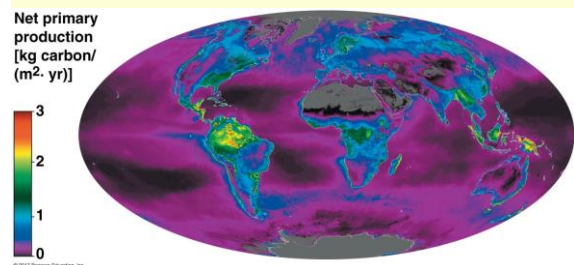


Fig. 55.5

Limitation in action

- **Eutrophication:** an experiment to determine causes



Secondary production

- Animal productivity
- Net or gross?



Energy flow

- Where does the food go?

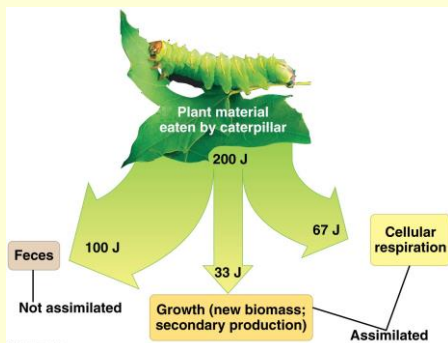
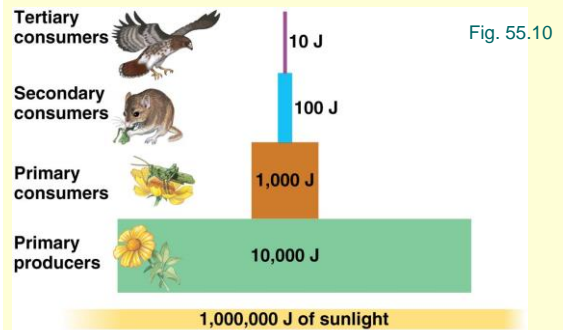


Fig. 55.9

Pyramid of production

- How efficient?



Nutrient cycling

- Unlike energy, nutrients can be recycled through an ecosystem
- Nutrients move between both biotic and abiotic portions of ecosystems
 - *Biogeochemical cycles*

Nutrient cycling model

- Where do organisms fit into these 'black boxes'?

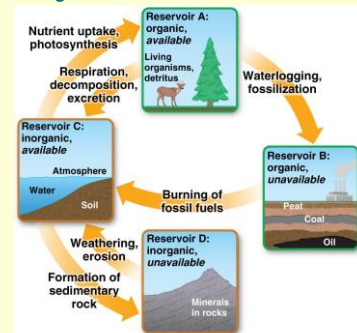
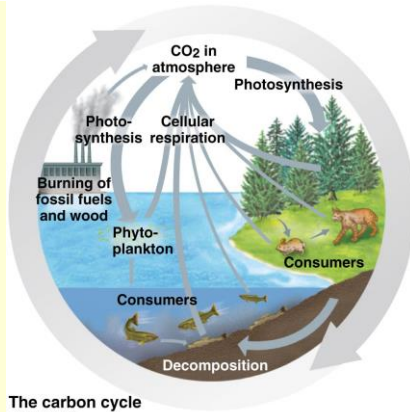
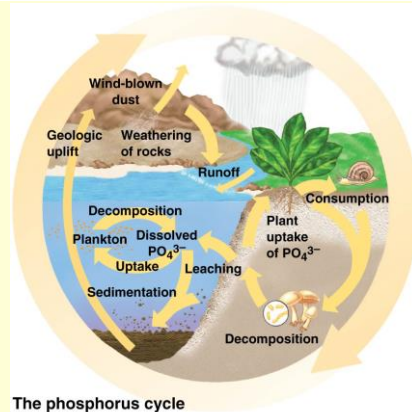


Fig. 55.13



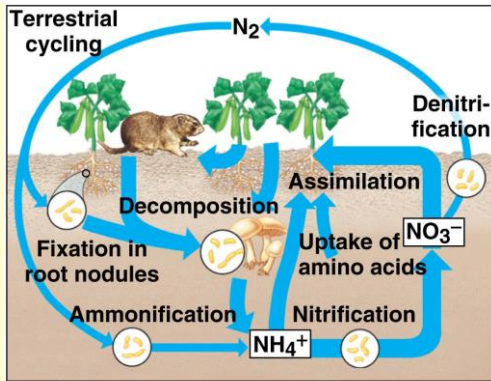
The carbon cycle

Fig. 55.14t



The phosphorus cycle

Fig. 55.14d



The nitrogen cycle

Fig. 55.14c

Nutrients and disturbances

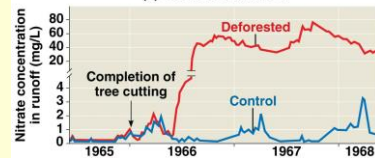


Fig. 55.15

(c) Nitrate in runoff from watersheds