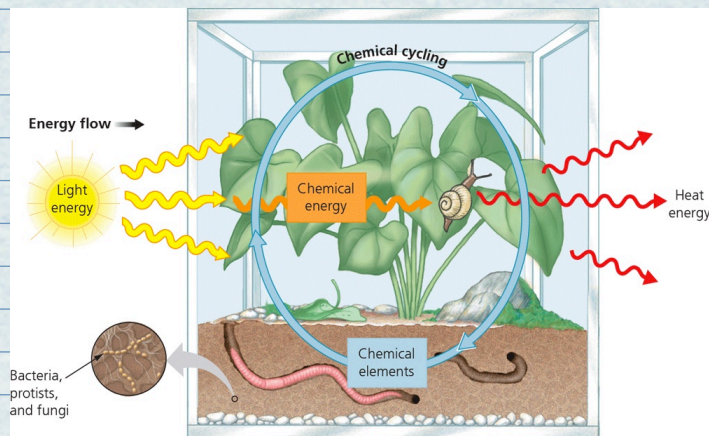


# ecosystem ecology

reminder: an ecosystem includes all the abiotic factors, such as energy, soil, atmosphere, and water.



for example :

— A TERRARIUM —

a terrarium microcosm demonstrates that matter, including water and nutrients, is recycled in an ecosystem, while energy dissipates as it flows through the trophic levels (the position it occupies in a food chain.)

## ENERGY FLOW

energy flow is the passage of energy through the components of the ecosystem. Energy enters the terrarium in the form of sunlight (yellow arrows). Plants (producers) convert light energy to chemical energy through the process of photosynthesis. Animals (consumers) take in some of this chemical energy in the form of organic compounds when they feed on the wastes and remains of other organisms. Every use of chemical energy involves a loss of some energy to the surroundings in the form of heat (red arrows). Energy is not destroyed, but it dissipates, so that it is not available to do work. Because so much of the energy captured by photosynthesis is lost as heat, this ecosystem would run out of energy if it were not powered by a continuous inflow of energy from the sun.

## CHEMICAL CYCLING

Chemical cycling is the use and reuse of chemical elements such as carbon & nitrogen within the ecosystem. Chemical cycling (blue arrows) involve the transfer of matter within the ecosystem. Chem. elements are not created or destroyed. They are cycled between the abiotic components of the ecosystem (including air, water, and soil) and the biotic components of the ecosystem (the community). Plants acquire these elements in inorganic form from the air and soil and use them to construct organic molecules. Animals, like the snail, consume some of these organic molecules. Decomposers feeding on dead plant and animal tissue produce  $CO_2$  and mineral wastes, returning most of the elements to the soil as the by products of plant & animal metabolism. If nutrients are lost due to erosion or b/c crops are removed from where they are produced, nutrients may become limited.

## summary

In summary, energy flow and chemical cycling involve the transfer of energy and matter through the trophic levels of the ecosystem. However, energy flows through, and ultimately out of, ecosystems, whereas chemicals are recycled within and between ecosystems.

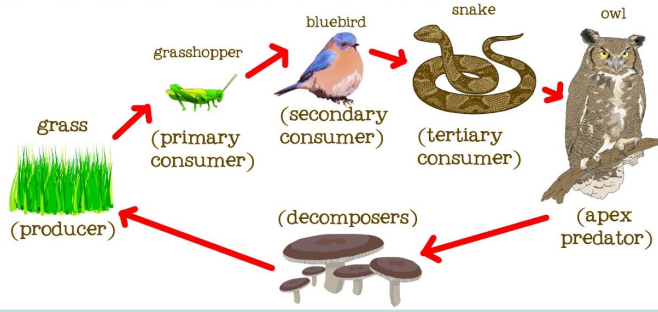
## energy flow in ecosystems

all organisms require energy for growth, maintenance, reproduction, and, in many species, locomotion.

## primary production & energy flow

ecologists call the amount, or mass, of living organic material in an ecosystem the *biomass*. The rate at which an ecosystem's producers convert solar energy to the chemical energy stored in organic compounds is called *primary production*. The primary production of the entire biosphere is roughly 165 billion tons of biomass per year.

# Food Chains



→ describes the trophic structure of an ecosystem

[APEX PREDATOR] also known as an alpha predators or top predator, is a predator at the top of a food chain, without natural predators. Apex predators are usually defined in terms of trophic dynamics, meaning that they occupy the highest trophic levels.

[TERTIARY CONSUMER] a carnivore at the topmost level in a food chain that feeds on other carnivores; an animal that feeds only on secondary consumers. In the real world, they can eat many different animals and even plants sometimes. This means that they can actually be carnivorous or omnivorous. (i.e. birds of prey, big cats, foxes, snakes)

[SECONDARY CONSUMERS] are organisms that eat primary consumers for energy. They can be carnivores or omnivores. In temperate regions, secondary consumers such as dogs, cats, moles, and birds or foxes, owls, wolves, crows, and hawks => examples that obtain their energy from primary consumers by scavenging

[PRIMARY CONSUMER] an organism that feeds on primary producers. They are usually herbivores that feed on autotrophic plants, which produce their own food through photosynthesis

[PRODUCERS] organisms capable of creating simple carbohydrates such as glucose, from gaseous carbon dioxide. This process of producing organic molecules from inorganic carbon sources is called primary production. On land, most producers are plants. Producers are any kind of green plant. They make their food by taking sunlight and using the energy to make sugar. The plant uses this sugar (glucose) to make things like wood, leaves, roots, & bark.

[DECOMPOSERS] are organisms that break down dead or decaying organisms, they carry out decomposition, a process possible by only certain kingdoms, such as fungi and bacteria. (in terrestrial ecosystems):

- beetle: type of shredder that eats & digests detritus
- earthworm: " "
- millipede: " "
- mushroom: type of fungi that grows out of the ground or the dead material its feeding off.

Fungi are the main decomposers in many ecosystems, particularly in forests. One of their main functions is to help release nitrogen & phosphorous from dead decaying matter.

