Terrestrial ecosystems

- Forests: dominated by trees. Ex. Tropical rain forest, Coniferous forests (taiga), Temperate deciduous forests
- Grasslands: dominated by grass. Ex. Tropical grasslands, Temperate grasslands (prairie)
- Deserts: characterized by lack of available moisture. Ex. Tundra, Deserts

Aquatic ecosystems

- Marine: Ex. Seashores, Oceans, Coral reefs, Estuaries
- Freshwater: Ex. Lakes, Ponds, Rivers, Streams

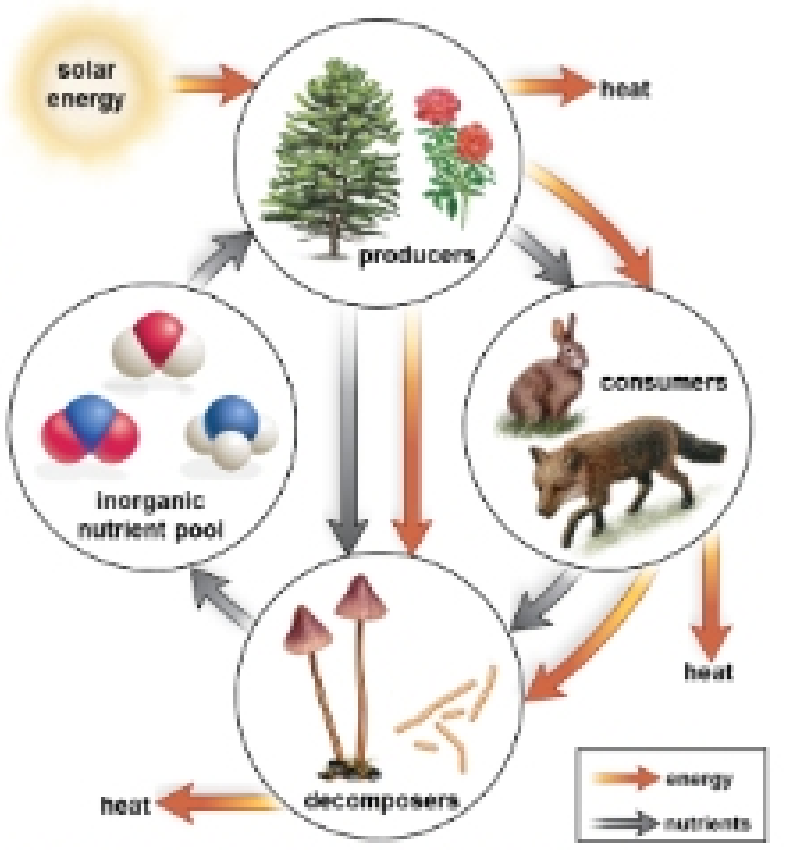
Components of an ecosystem

- Abiotic components – nonliving environment
- Biotic components - living components
  - Autotrophs – producers
  - Heterotrophs – consumers
    - Herbivores – feed on plants and algae
    - Carnivores – feed on other animals
    - Omnivores – eat both plants and animals
    - Detritus feeders – feed on decomposing organic matter

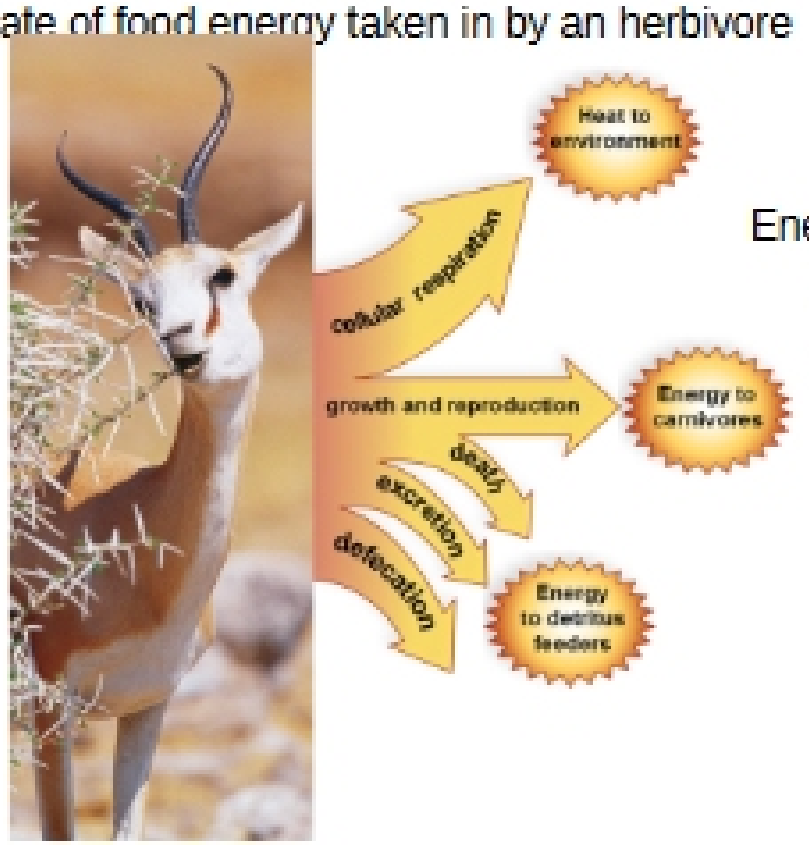
Niche – the role an organism plays in an ecosystem such as how it gets its food, what it eats, and how it interacts with other organisms

Energy flow and chemical cycling

- Energy flow
  - It begins and continues when producers absorb solar energy.
  - Energy flow occurs as nutrients pass from one population to another.
  - This energy is converted to heat that dissipates into the environment.
  - Only a portion of energy is passed to organisms as they consume one another.
- Chemical cycling
  - Inorganic nutrients are returned to producers from the atmosphere or soil.
  - Chemicals recycle within and between ecosystems.



Fate of food energy taken in by an herbivore

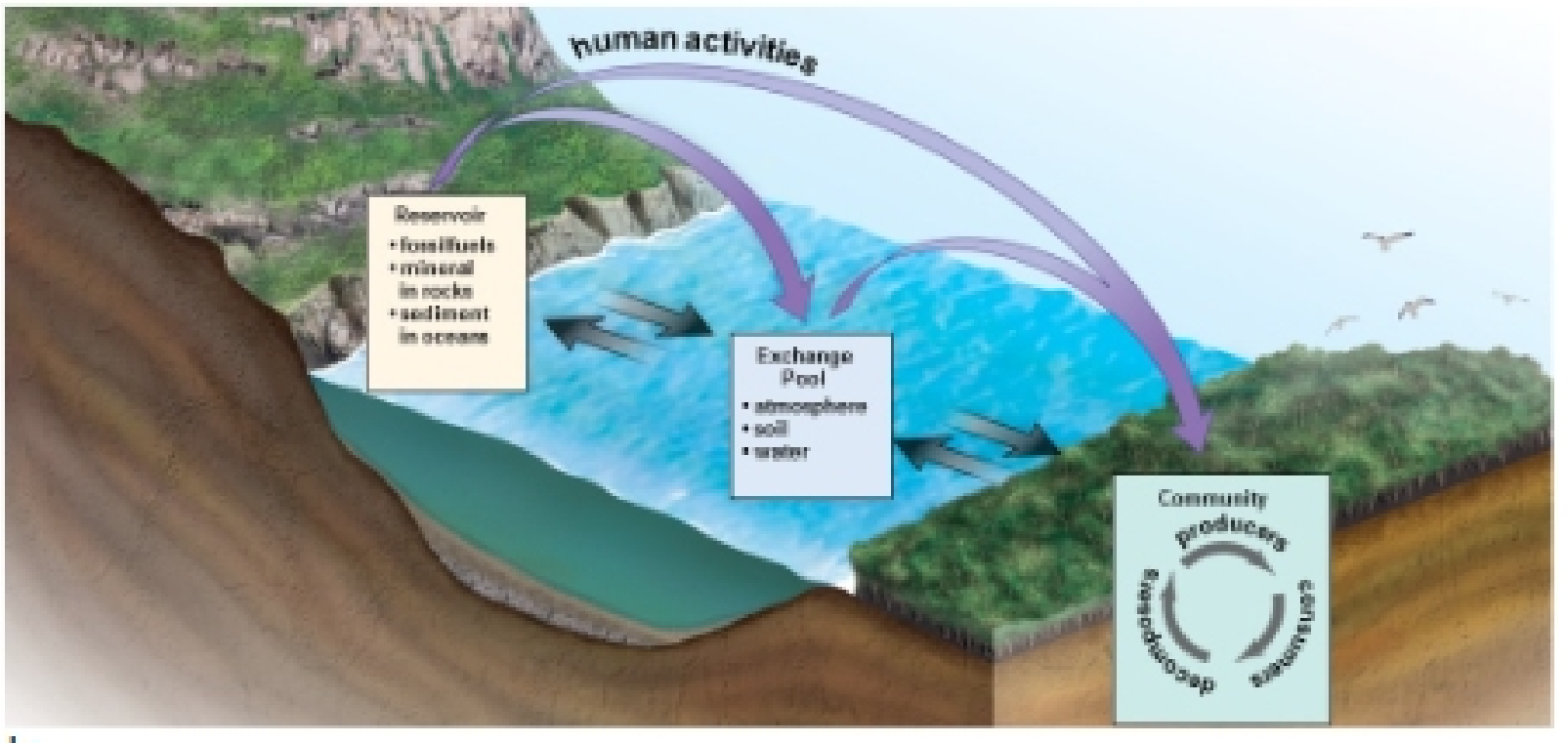


Energy Flow

- Food web – describes who eats whom in an ecosystem
- Trophic levels – composed of all organisms that feed at a particular link in the food chain
  - Producers, primary consumers, and secondary consumers
  - Ecological Pyramid – reflects the loss of energy from one trophic level to another.
    - Only about 10% of the energy of one trophic level is available to the next trophic level.

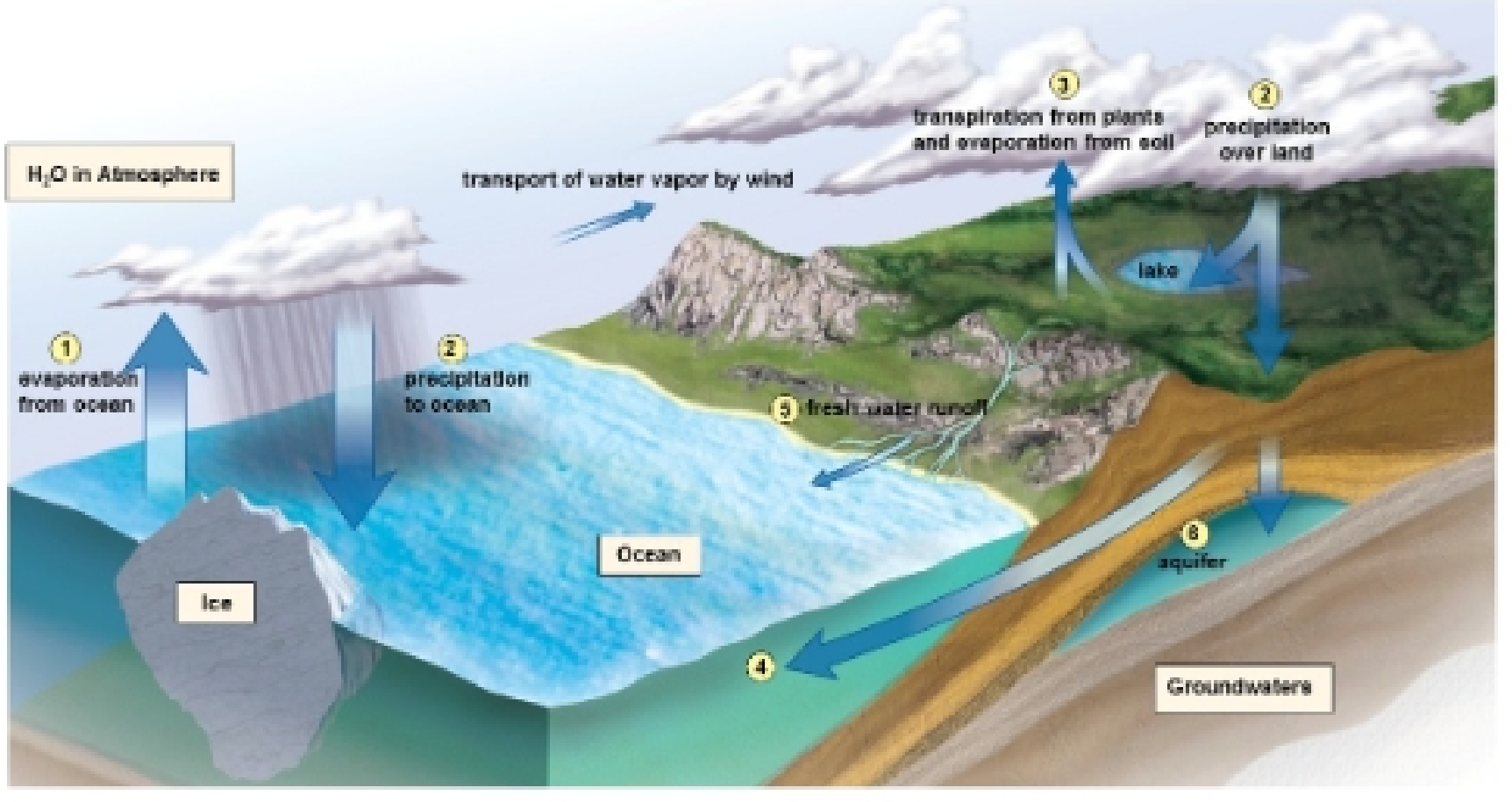
Chemical cycling

- Biogeochemical cycles are pathways by which chemicals circulate through an ecosystem.
  - Water cycle
  - Carbon cycle
  - Nitrogen cycle
  - Phosphorus cycle
- Reservoir – fossil fuels, minerals in rocks, and sediments in oceans contain inorganic nutrients that are limited in availability
- Exchange pools – atmosphere, soil, and water are ready sources of inorganic nutrients



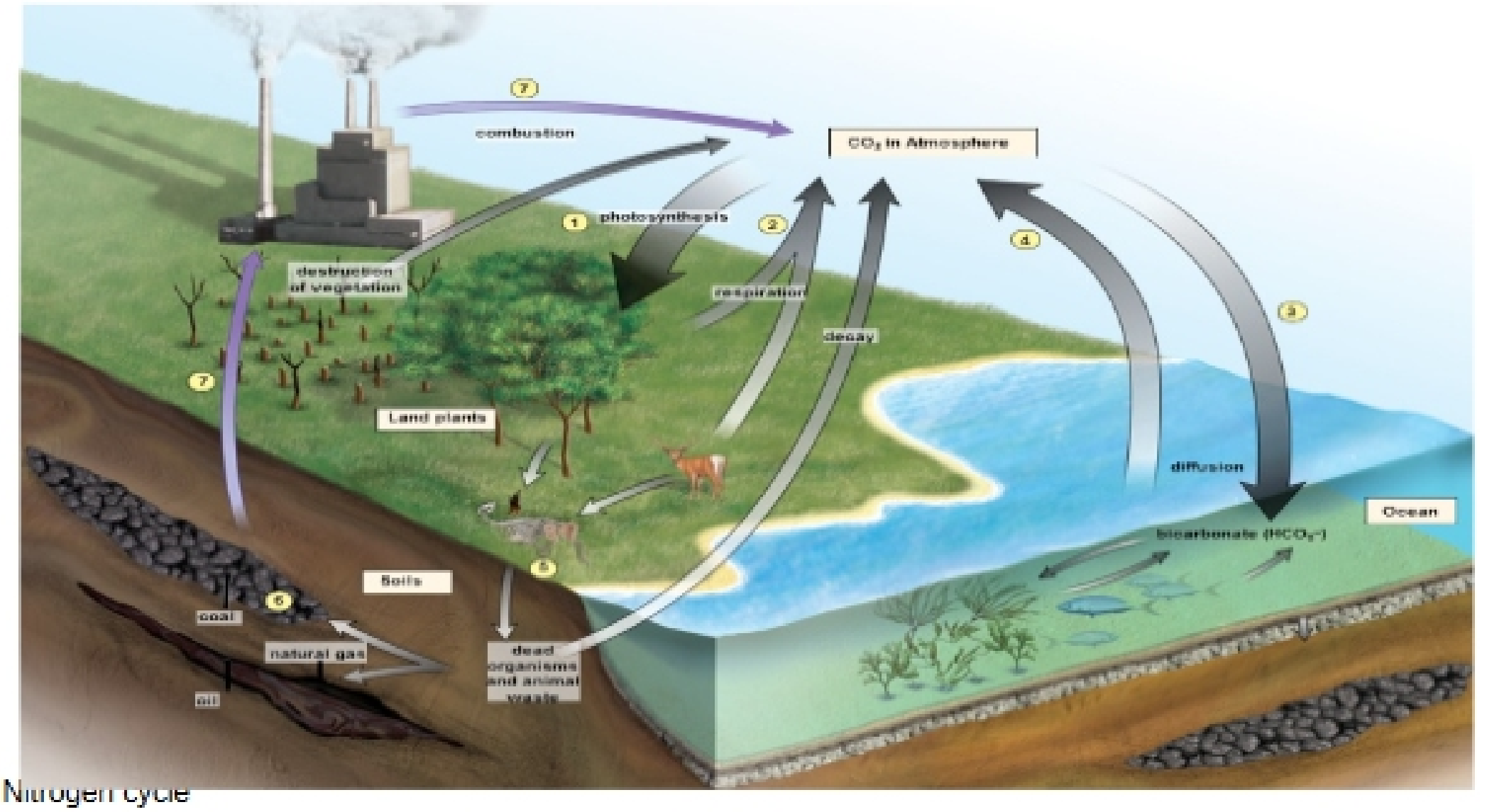
Water cycle

- Water evaporates from bodies of water, land, and plants, and returns when water falls on land to enter the ground, surface waters, or aquifers.
- Human activities that interfere
  - Withdrawing water from aquifers
  - Clearing vegetation from the land and building structures that prevent percolation and increase runoff
  - Adding pollutants to water such as sewage and chemicals



Carbon cycle

- CO_2 is exchanged between the atmosphere and living organisms.
- Plants incorporate atmospheric CO_2 into nutrients through photosynthesis, providing food for themselves and other organisms.
- CO_2 is returned to the atmosphere through respiration.
- Human activities that interfere
  - Burning of fossil fuels and the destruction of forests are adding CO_2 to the atmosphere faster than it is being removed.
  - CO_2 and other gases (N_2O and CH_4) are being emitted due to human activities.
  - These gases are called greenhouse gases because they trap heat; this contributes to global warming.



Nitrogen cycle

(*Whatever is not absorbed by plants, bacteria removes it and releases pure oxygen into atmosphere.)

- 78% of the atmosphere is nitrogen gas (N_2) but plants cannot use this form.
- Nitrogen-fixing bacteria convert nitrogen gas to ammonium (NH_4^+), which can be used by plants.
- Nitrifying bacteria convert ammonium to nitrate (NO_3^-).
- Bacteria convert nitrate back to nitrogen gas through a process called denitrification.
- Human activities that interfere
  - We add nitrogen fertilizers that run off into lakes and streams, causing major fish kills ('eutrophication').
  - Burning of fossil fuels
  - Puts nitrogen oxides and sulfur dioxide into the atmosphere, where they combine with water vapor to form acids that return to earth as acid deposition
  - Result in nitrogen oxides and hydrocarbons that react with one another to produce smog