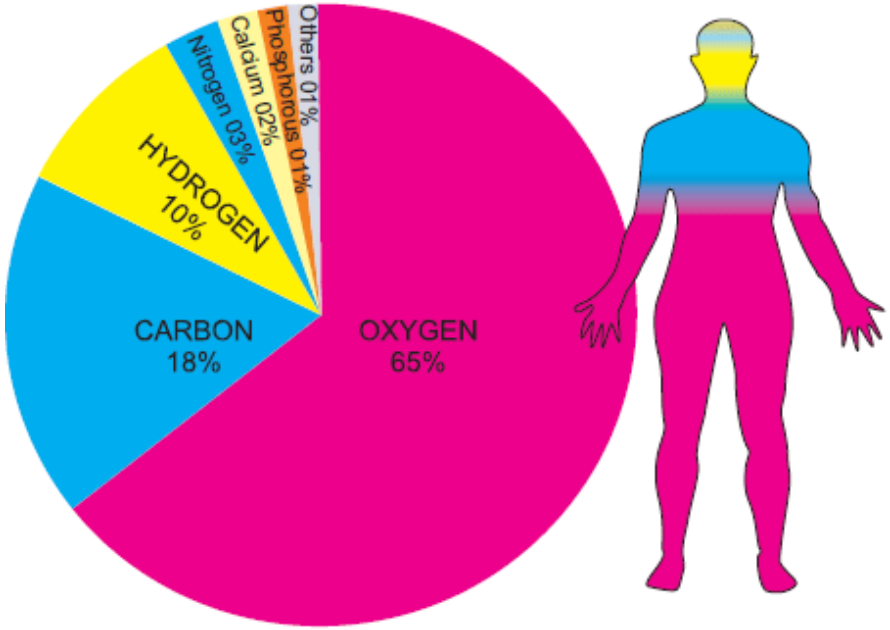
Yakın Doğu Üniversitesi
Mimarlık Fakültesi
Peyzaj Mimarlığı Bölümü

PM 317 Human and Environment

Assoc. Prof. Dr. Salih GÜCEL

Composition of Living Organisms

- All organisms are composed of matter, and although all organisms grow and reproduce, they cannot create new matter.

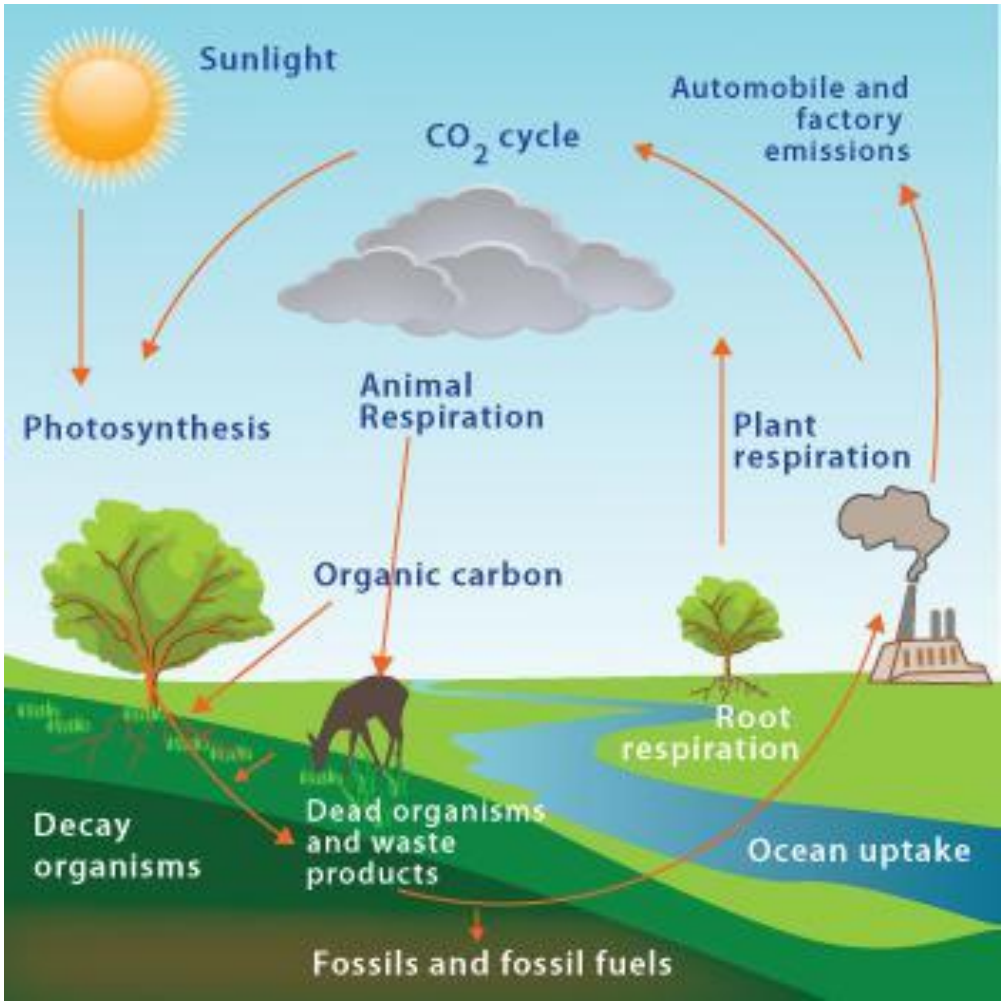


- In order to grow and accumulate biomass, they must use the elements that are already around them in the air, soil, water and other organisms. ,
- **Macronutrients**, or elements required by all organisms in relatively large amounts.

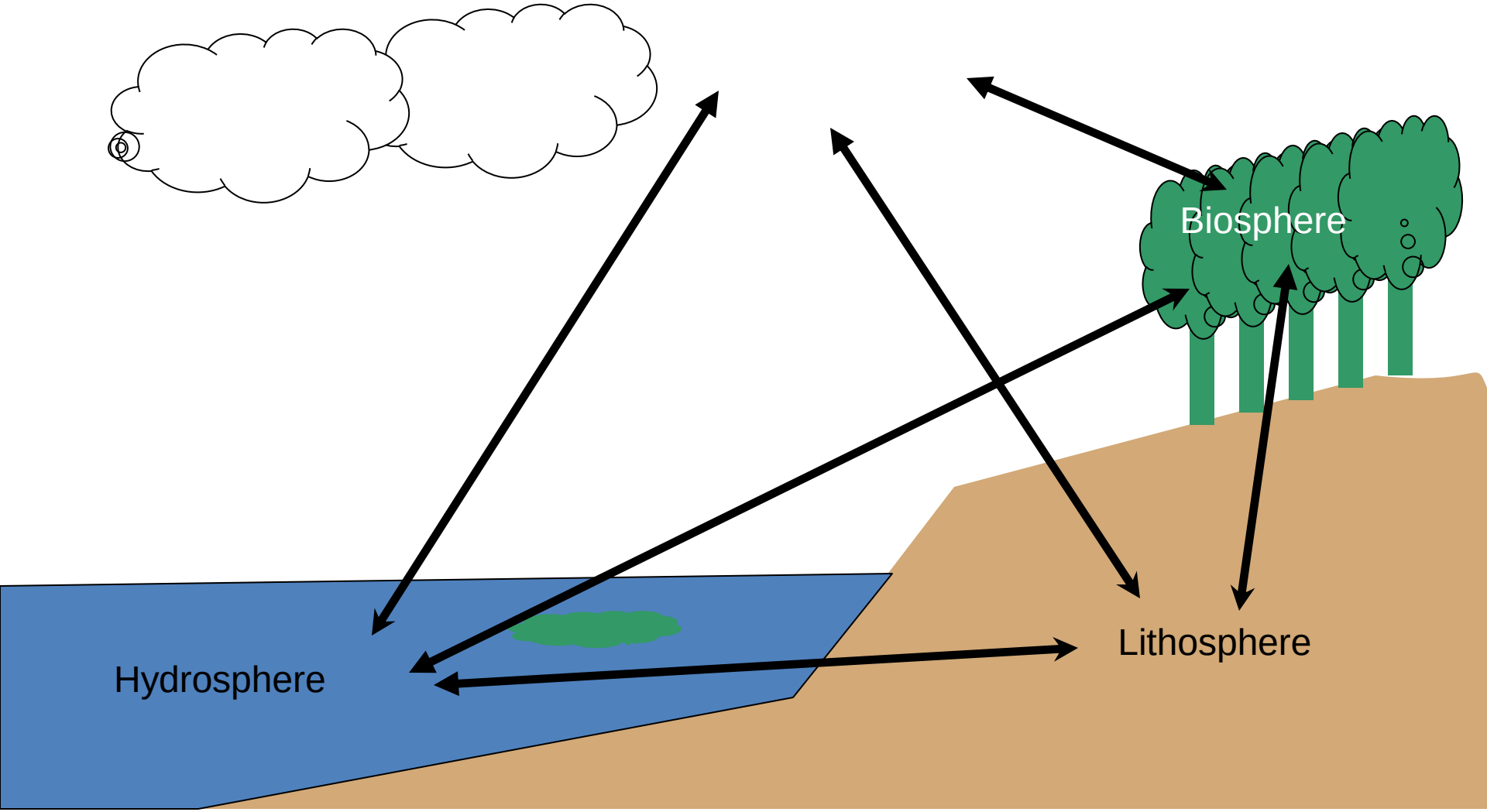
- In addition to oxygen, carbon, hydrogen and nitrogen, there are other necessary elements, found in very small amounts in organisms, called **trace elements**.

Biogeochemical Cycles

- All elements that living things use are constantly cycling through organisms and the environment they live in.
- How an element cycles through organisms and the environment is called a **biogeochemical cycle**.
- There are many possible routes that elements can take in a biogeochemical cycle.



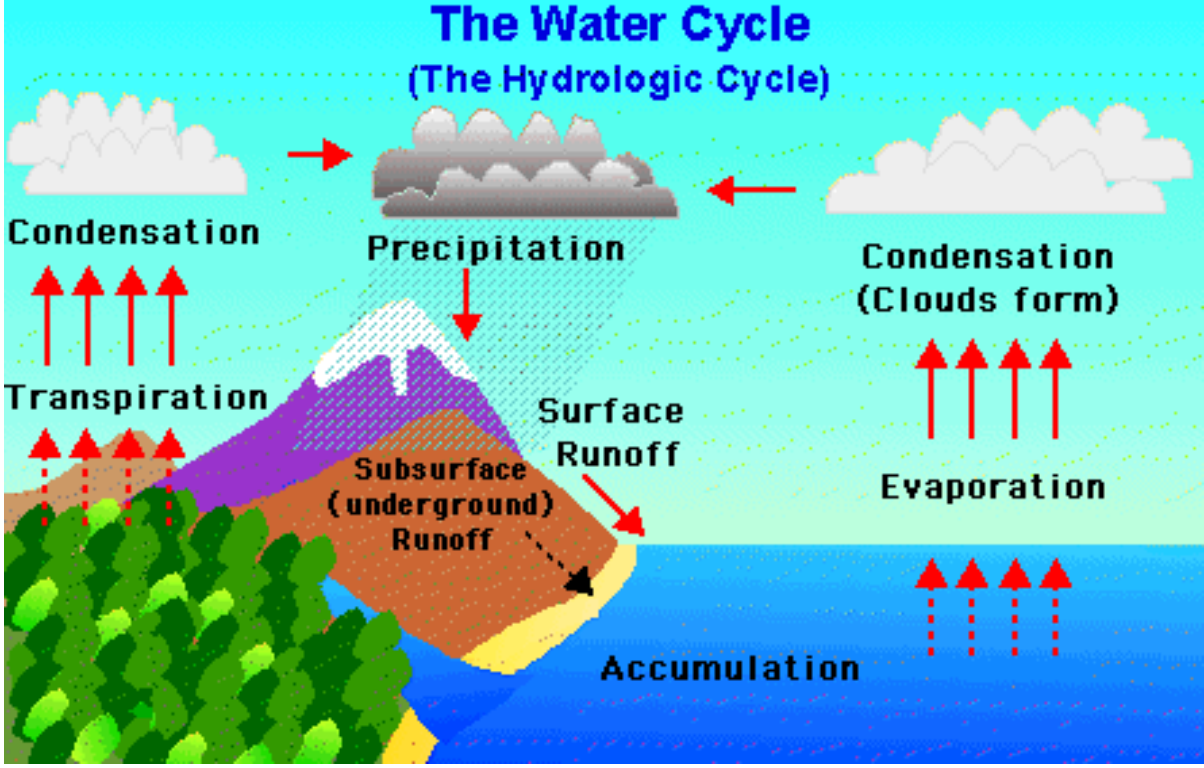
Biogeochemical Cycles: Reservoirs & Pathways



Some Major Cycles of Matter

- Water Cycle
- Chemical Cycles
  - Carbon
  - Nitrogen
  - Phosphorous
  - Sulfur

- Heat energy from the sun causes water in puddles, streams, rivers, seas or lakes to change from a liquid to a water vapor.
- This is called **evaporation**.



- The vapor rises into the air and collects in clouds.
- Water vapor collects in clouds. As the clouds cool the water vapor condenses into water drops. This is called **condensation**.
- These drops fall to the earth as rain, snow or hail.
- Water falls to the earth from clouds. Mainly as rain, but sometimes as snow and hail. This is called **precipitation**.
- Transpiration is the process by which plants lose water out of their leaves.

Carbon Transfer:
Biosphere ↔ Atmosphere

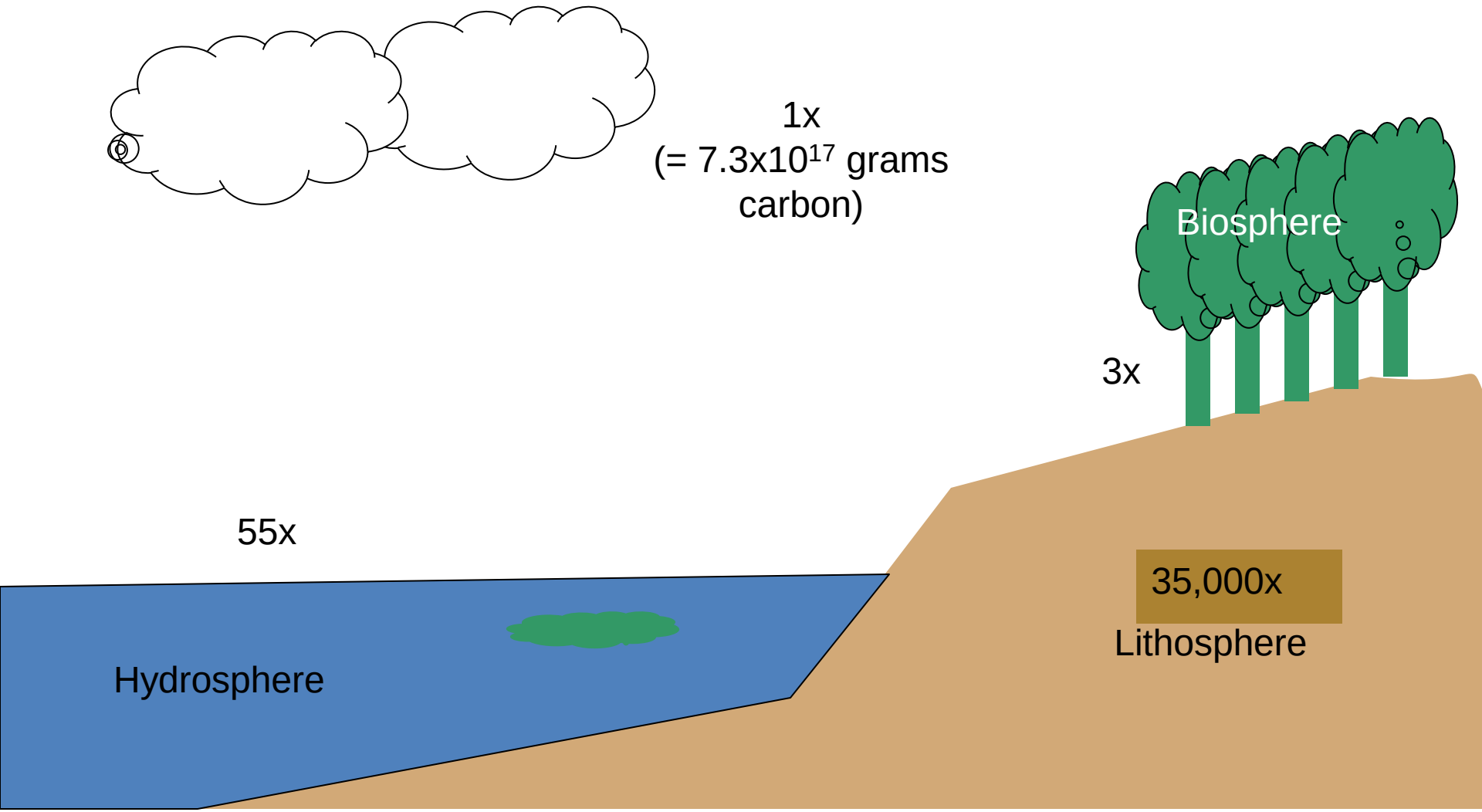
Photosynthesis (Atmosphere to Biosphere)

Carbon Dioxide + Water + Sunlight --> Sugar + Oxygen

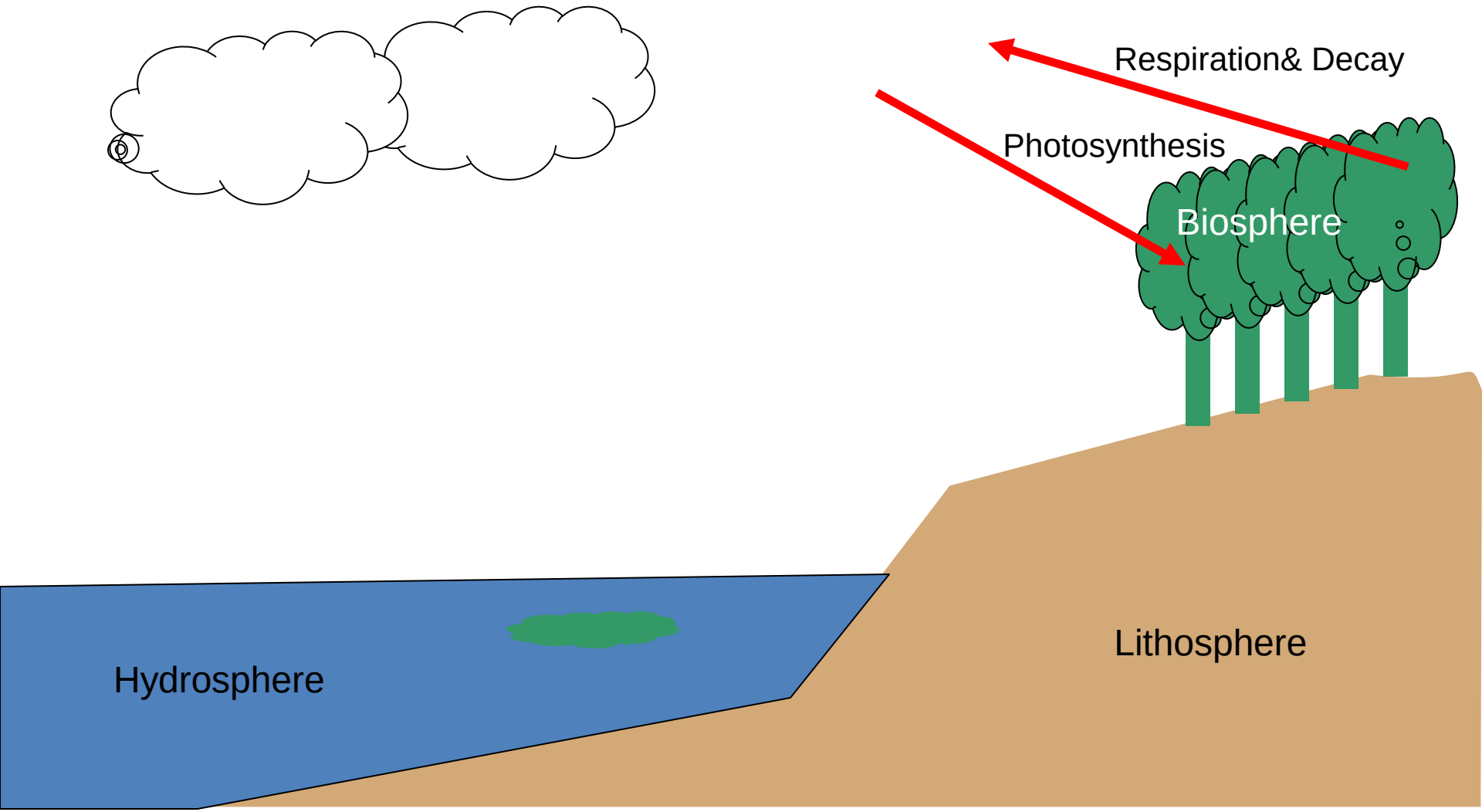
Respiration (Biosphere to Atmosphere)

Sugar + Oxygen --> Carbon Dioxide + Water + Energy

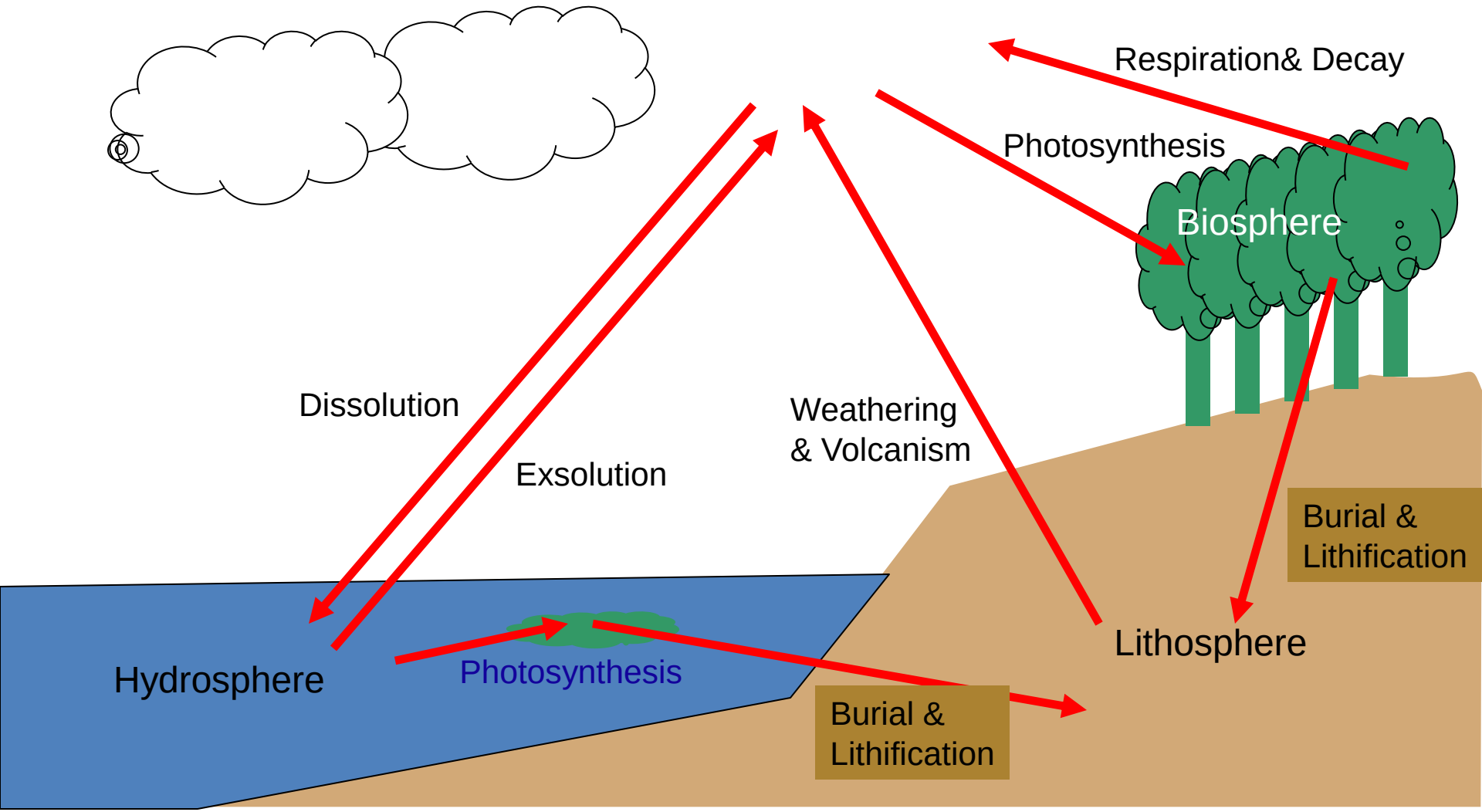
Carbon Cycle: Reservoirs



Carbon Cycle

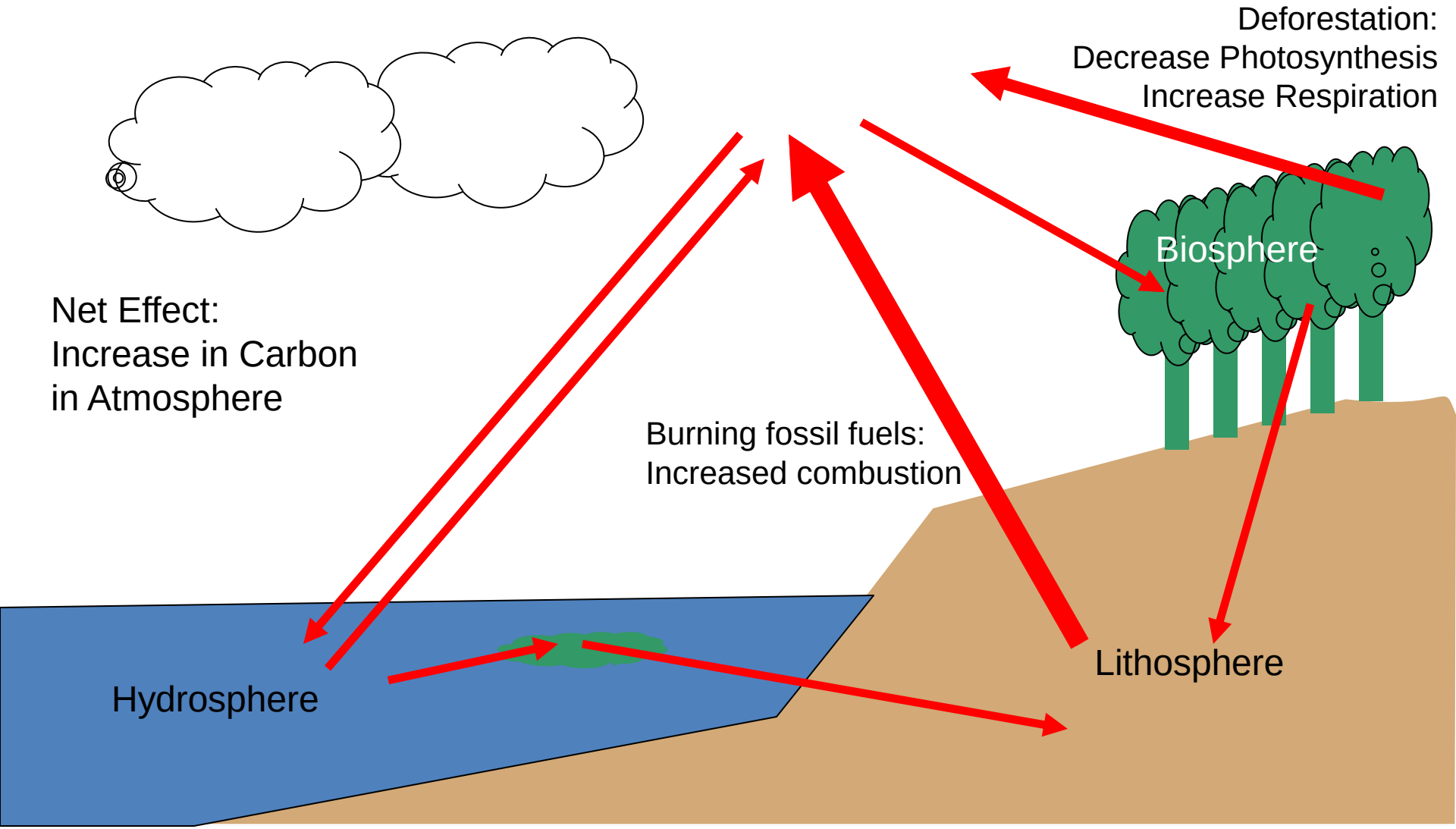


Carbon Cycle

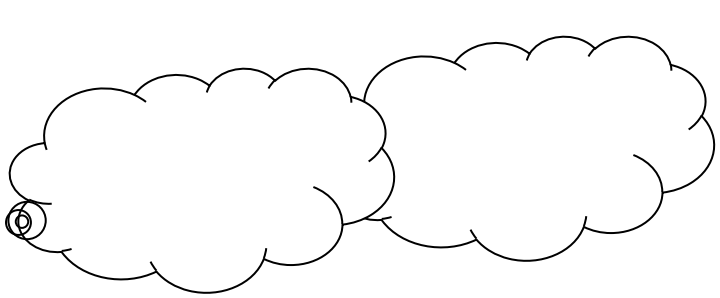


Human Impacts

Carbon Cycle

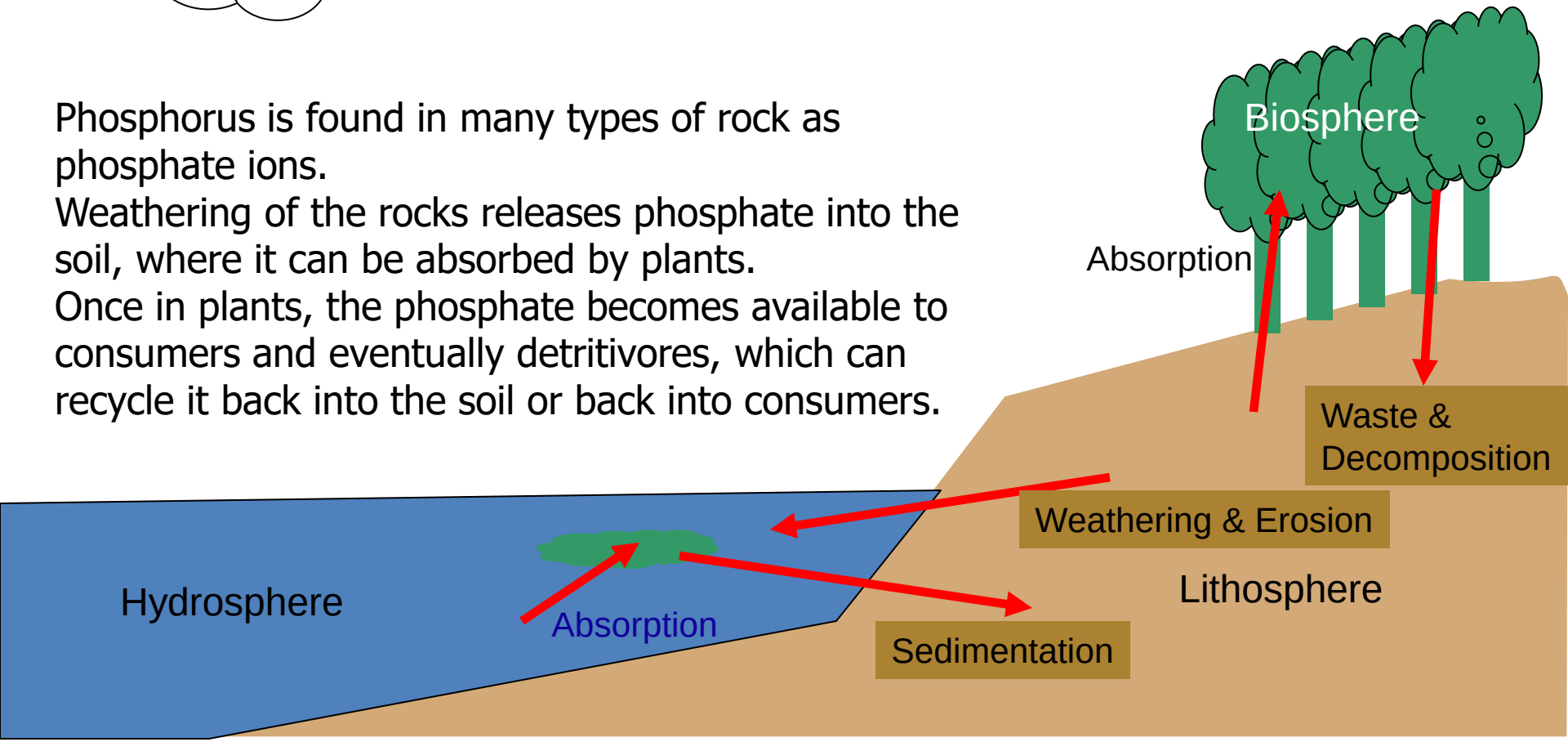


Phosphorous Cycle



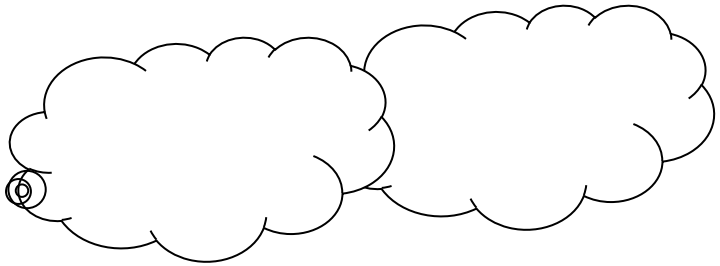
Never enters the atmosphere

Phosphorus is found in many types of rock as phosphate ions.
Weathering of the rocks releases phosphate into the soil, where it can be absorbed by plants.
Once in plants, the phosphate becomes available to consumers and eventually detritivores, which can recycle it back into the soil or back into consumers.

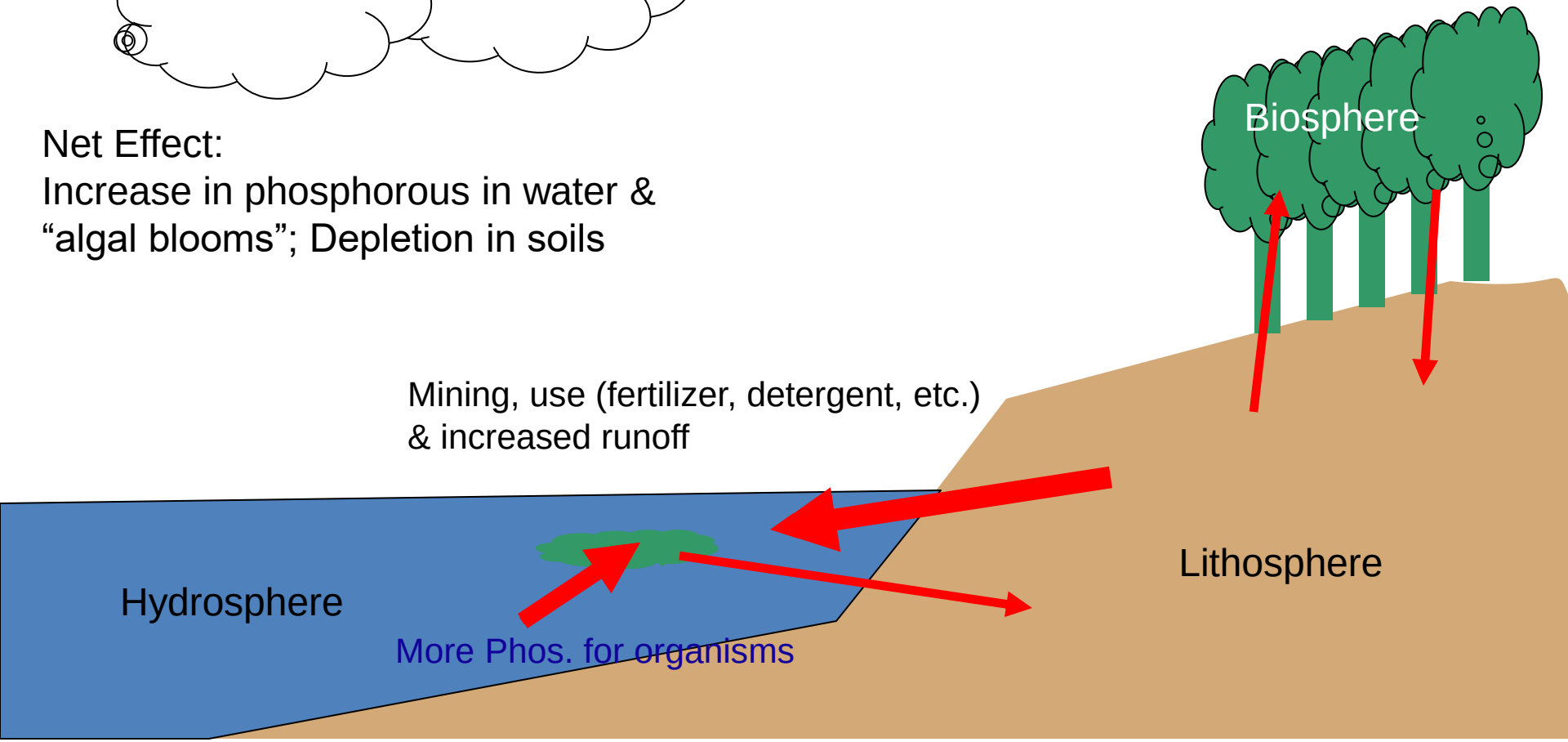


Human Impacts

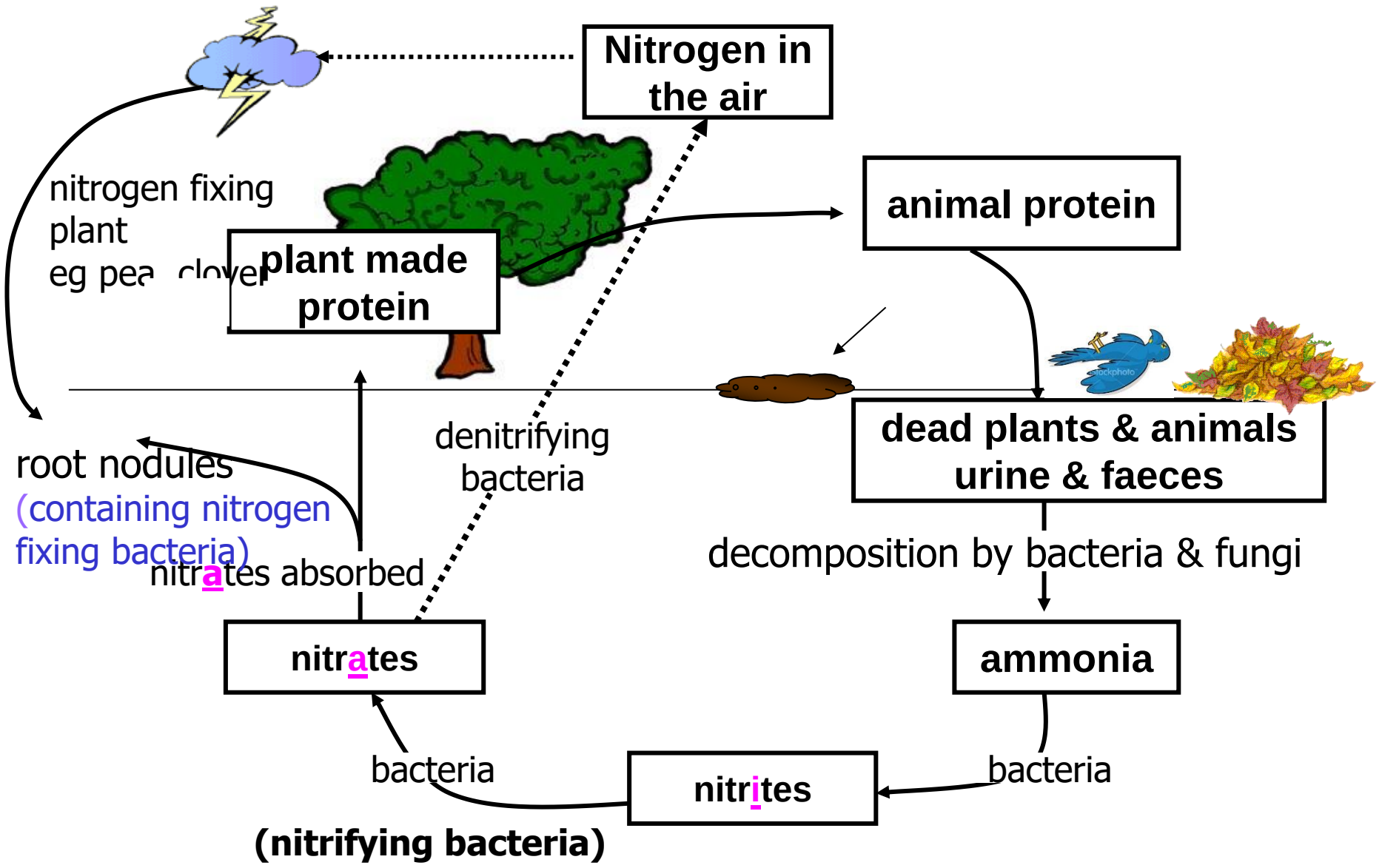
Phosphorous Cycle



Net Effect:
Increase in phosphorous in water & "algal blooms"; Depletion in soils



Nitrogen Cycle

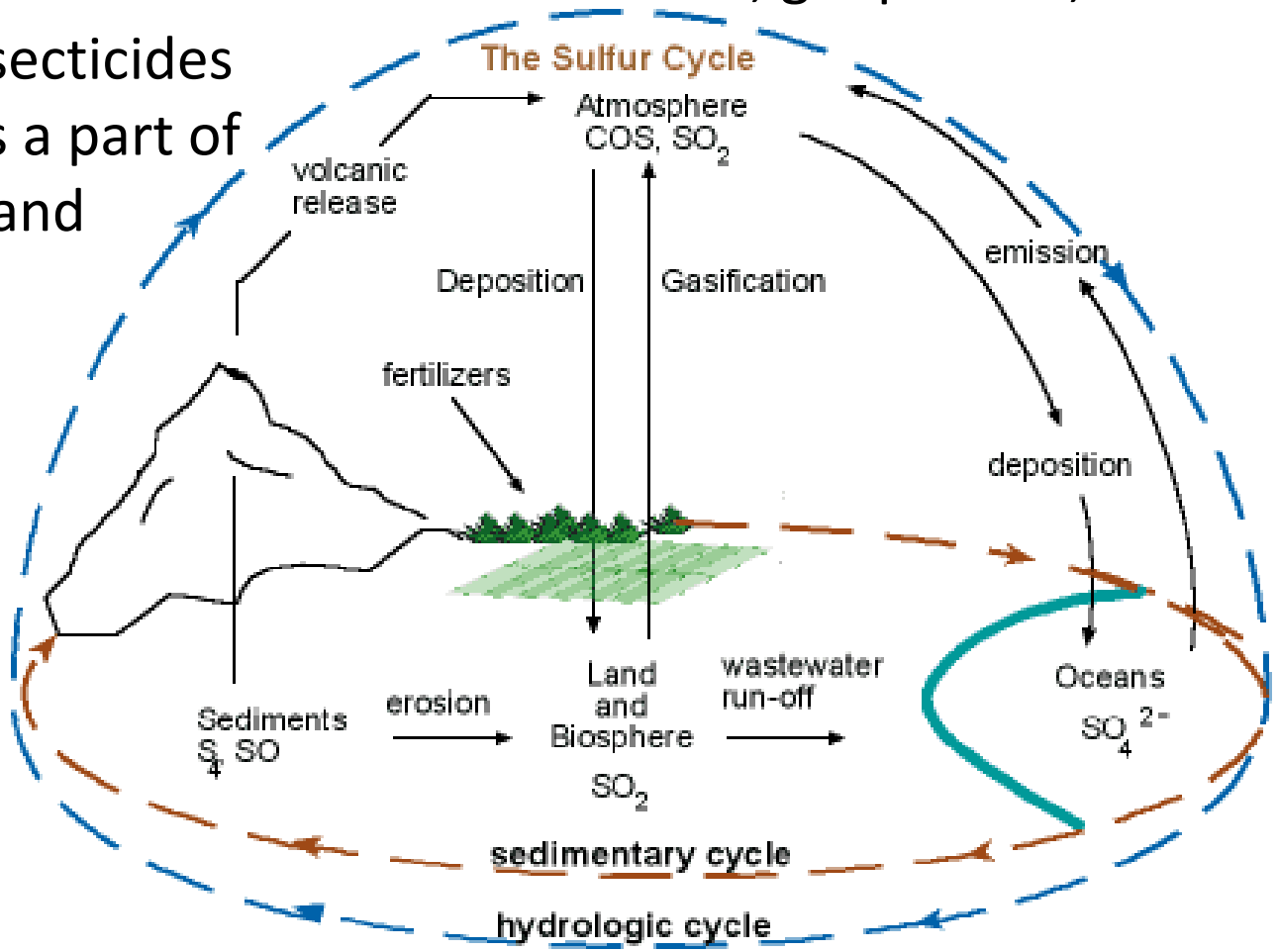


Nitrogen Cycle

- Nitrogen fixing bacteria in the soil and in plant roots convert nitrogen from the atmosphere to ammonia. The ammonia is then used by plants or converted to nitrite and then nitrate by nitrifying bacteria. The nitrite and nitrate can also be used by plants. The plants are then eaten by herbivores, which can then be eaten by carnivores. Animal waste products are high in ammonia and ammonia derivatives like urea, both of which are usable sources of nitrogen for plants. If there is an abundance of nitrate in the soil, denitrifying bacteria can convert some of it back to atmospheric nitrogen.

Sulfur Cycle

Sulfur is the 10th most abundant element in the environment, with most of it stored underground in rocks and minerals and in ocean floor deposits. Sulfur is used for fertilizers, gunpowder, matches, and in insecticides and fungicides. It is a part of vitamins, proteins and hormones that are considered critical to climate and health of various ecosystems.



Effects of Human Progress on the Sulfur Cycle

- Human activities since the start of the Industrial Revolution contributed to most of the sulfur that enters the atmosphere.
- Emissions from human activities react to produce sulfate salts that create acid rain.
- Sulfur dioxide aerosols absorb ultraviolet rays, which cools areas and offsets global warming caused by greenhouse effect.

Why these cycles and what is the problem?

- Since the Earth first came into existence environmental change has involved the redistribution of elements and compounds via biogeochemical cycles. Such cycles link the lithosphere, biosphere and atmosphere within reciprocal relationships. These relationships have been profoundly altered by human activity but remain reciprocal.
- Anthropogenic arangements of these cycles has given rise to some of the most important environmental issues of the 1990s, notably global climatic change, acidification and eutrophication.