

Biogeochemical Processes



Outdoor Education 12

March 2020

Environmental Conservation:

The protection, preservation, management, or restoration of natural environments and the ecological communities that inhabit them.

Environmental Sustainability:

Consuming resources in a manner that could be continued indefinitely. If the activity cannot be continued indefinitely then it is not *sustainable*.

Key Points

Matter is never lost or created, as the earth is a closed system

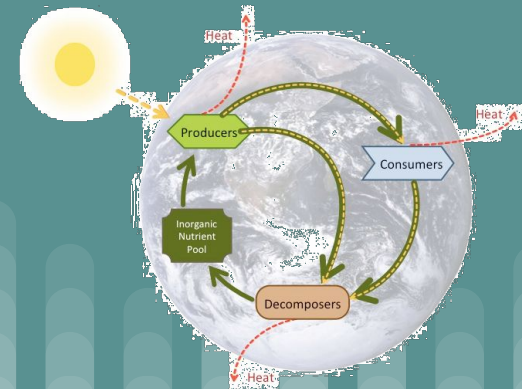
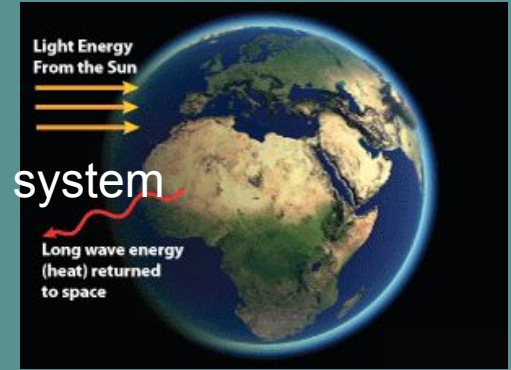
All atoms on the earth are constantly being recycled

Biogeochemical cycles describe how an element or chemical moves between various locations in the biosphere

Biogeochemical cycles important to living organisms include:

- ❑ The Water cycle
- ❑ The Carbon cycle
- ❑ The Nitrogen Cycle
- ❑ The Phosphorus
- ❑ The Sulfur Cycle

Ecosystem:
Biotic factors
vs.
Abiotic factors



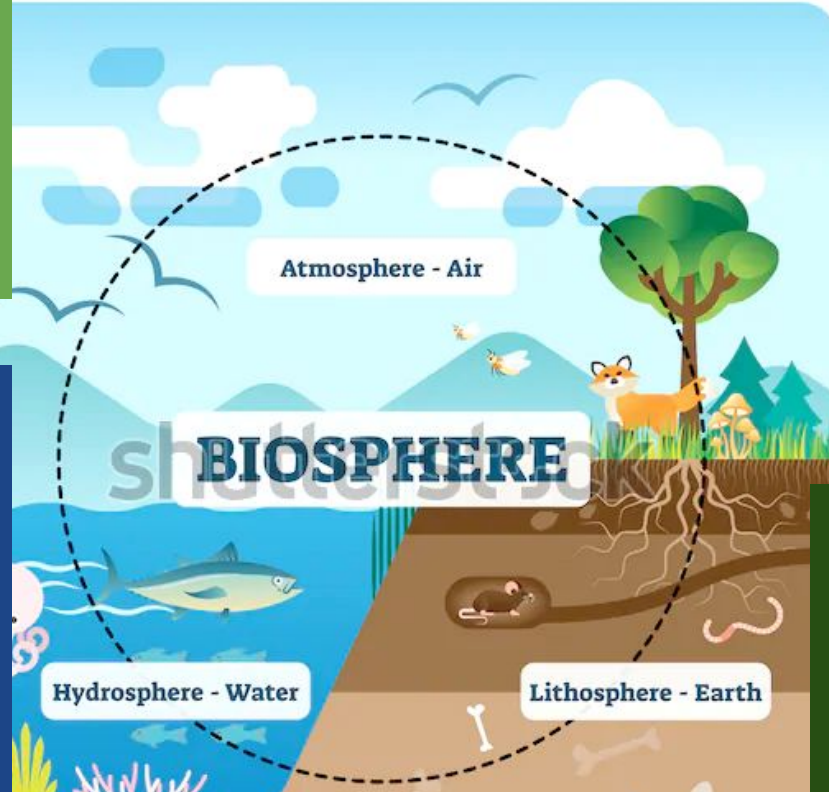
BIOTIC AND ABIOTIC FACTORS



The Biogeochemical cycles take place on the earth's surface:

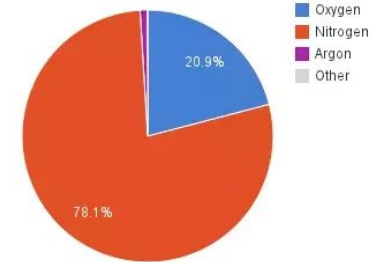
Biosphere: The regions of the surface of the earth occupied by living organisms.

Hydrosphere: Places where there is water including rivers, lakes, oceans, polar ice caps, soil moisture and water vapour in the air.



Atmosphere: The envelope of gases surrounding the earth.

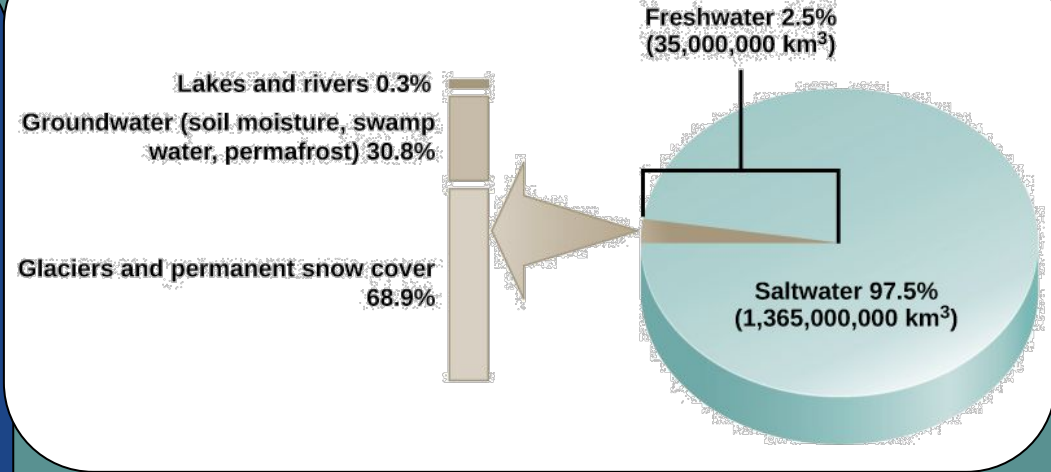
Air Composition (% by volume)



Lithosphere: The soil and solid, outermost layers of Earth's structure.

The Water (Hydrologic) cycle

- Most of earth's water is in oceans. Only a small amount is accessible freshwater.
- Much water is tied up in ice, oceans and underground, and cycles more slowly than surface water.
- Pollution further decreases the amount of freshwater available for humans and animals.



Water Cycle Key Terms:

Evaporation:

Sublimation:

Transpiration:

Water vapour:

Condensation:

Transportation:

Precipitation:

Runoff:

Surface flow:

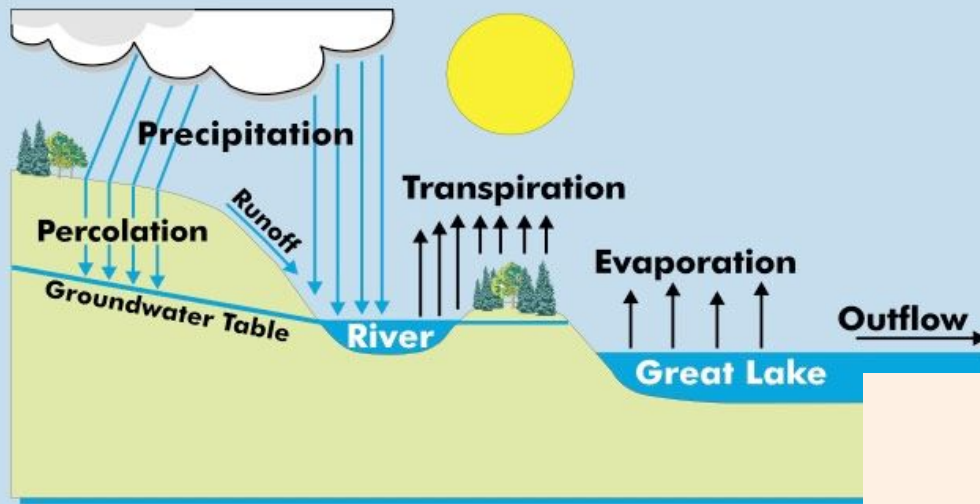
Groundwater:

Infiltration:



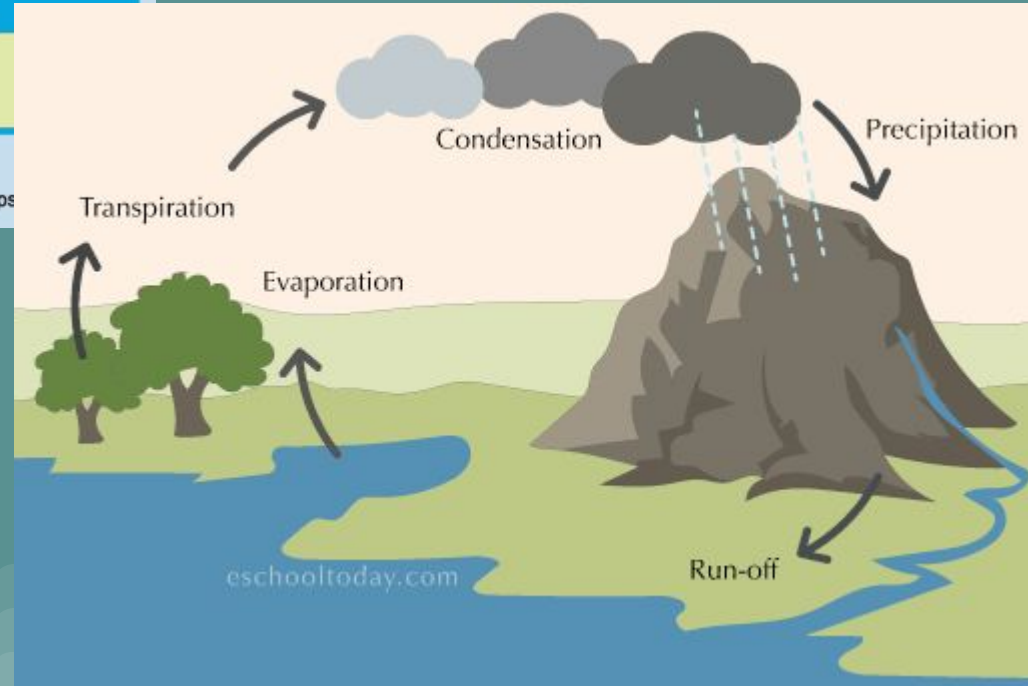
Weathering

Erosion



Hydrologic Cycle

Image: U.S. Army Corps



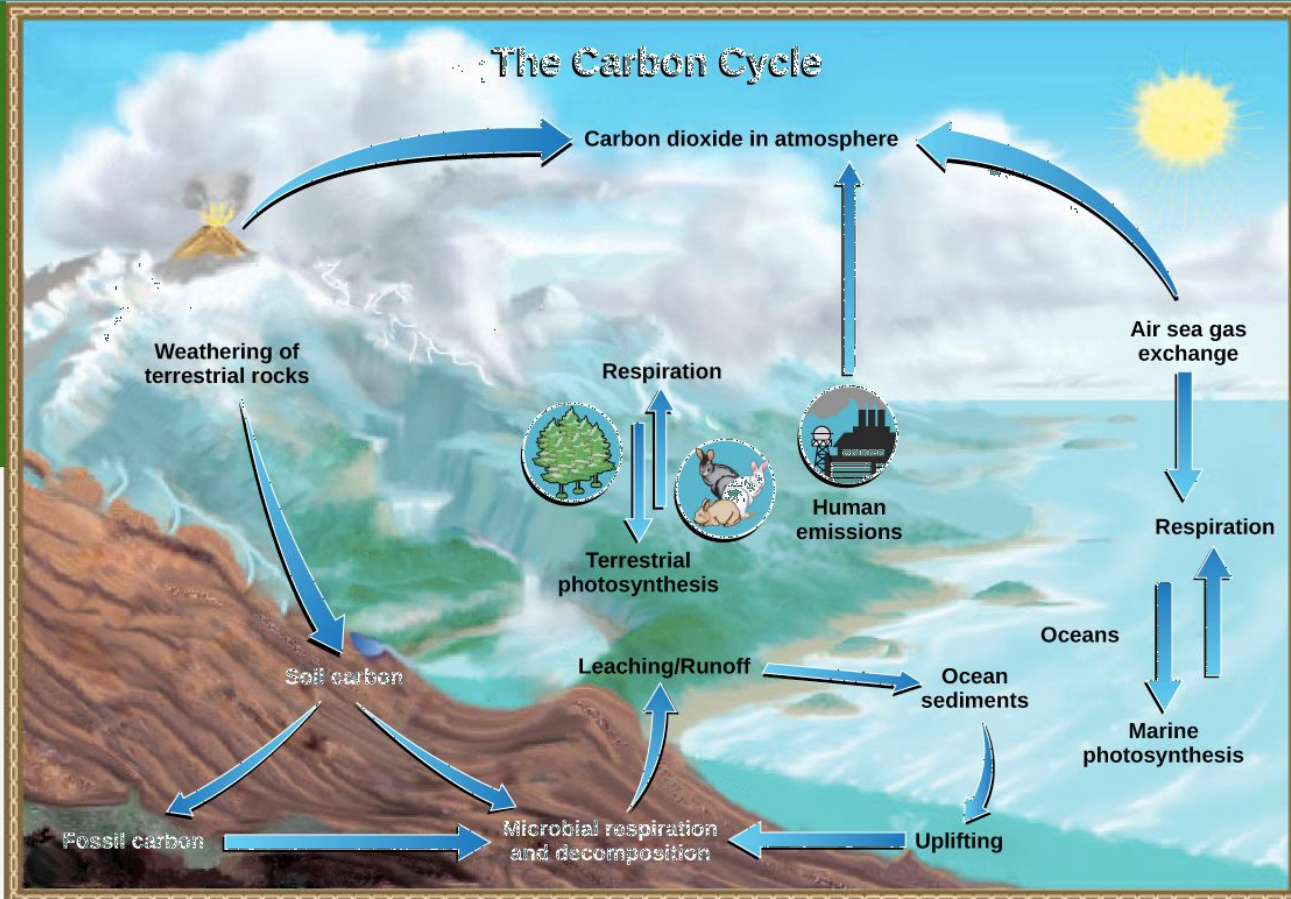
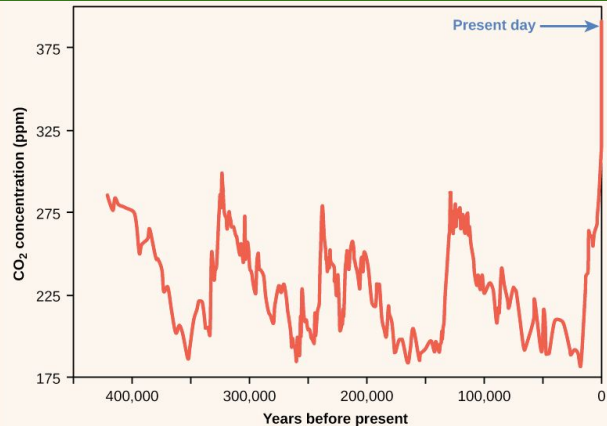
The Carbon Cycle

- Carbon is an essential element in the bodies of living organisms. About 18% of your body consists of carbon atoms, by mass.
- Carbon dioxide from the atmosphere is taken up by photosynthetic organisms (plants) and used to make organic molecules, which travel through food chains. In the end, the carbon atoms are released in respiration.
- Slow geological processes, including the formation of sedimentary rock and fossil fuels, contribute to the carbon cycle over long timescales.
- Some human activities, such as burning of fossil fuels and deforestation, increase atmospheric Carbon Dioxide and affect Earth's climate and oceans. Carbon Dioxide is a greenhouse gas.

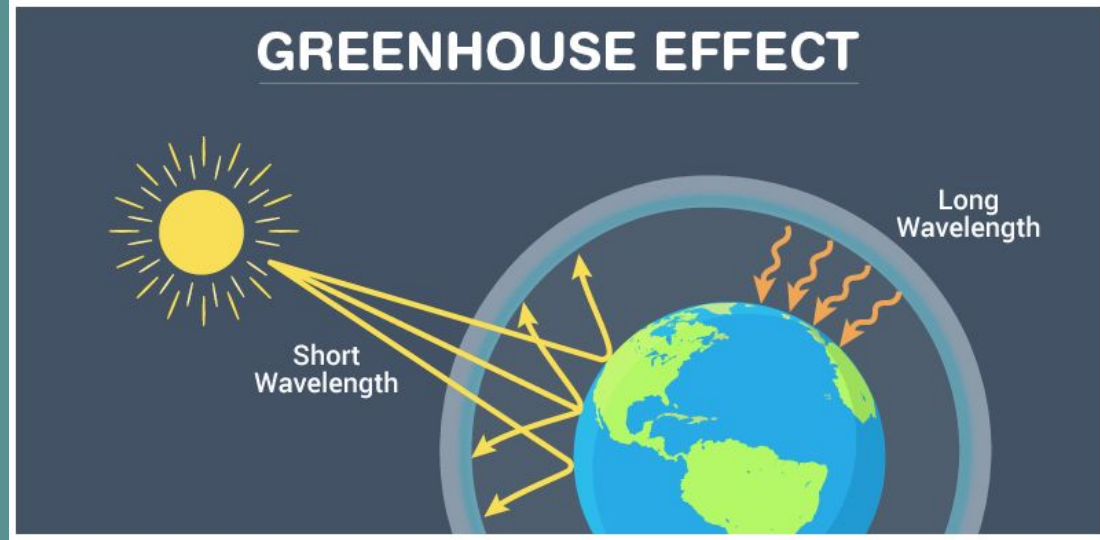
The Carbon Cycle

Fossil fuels are a **nonrenewable resource** because they are being used up much faster than they can be produced by geological processes.

Trees and plants in forests sequester carbon, which means deforestation releases CO₂ into the atmosphere, and removes storage capacity at the same time.



The Greenhouse Effect



The *greenhouse effect* is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by *greenhouse* gases. However, Earth's *greenhouse effect* is getting stronger as we add greenhouse gases to the atmosphere. This contributes to the warming of the climate of our planet.

Carbon Footprint

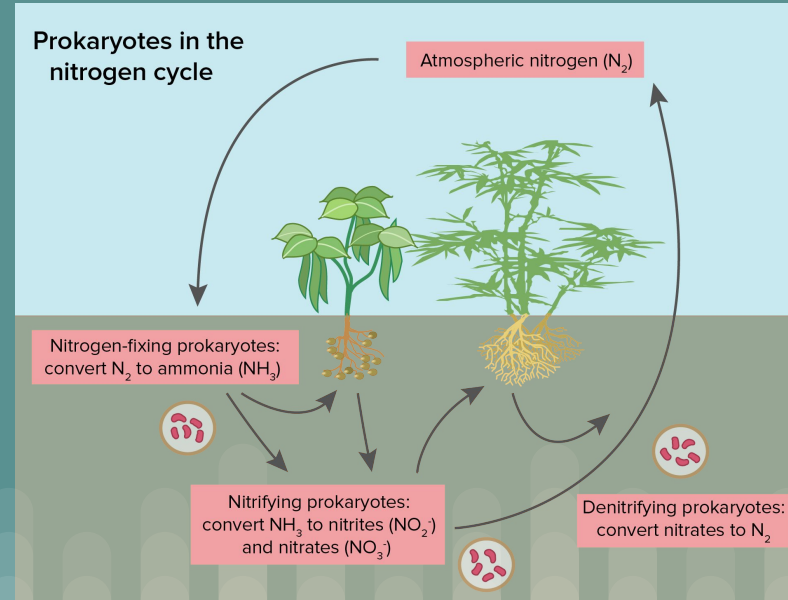
A carbon footprint is his defined as the total greenhouse gas (GHG) *emissions* caused by an individual, event, organization, or product, expressed as *carbon* dioxide equivalent.



The Nitrogen Cycle

Nitrogen is a common **limiting nutrient** in nature, and agriculture. This mean it is in shortest supply and limits growth.

Nitrogen enters the living world by way of bacteria and other single-celled prokaryotes, which convert atmospheric nitrogen into biologically usable forms in a process called *nitrogen fixation*.





MooMooMath and Science

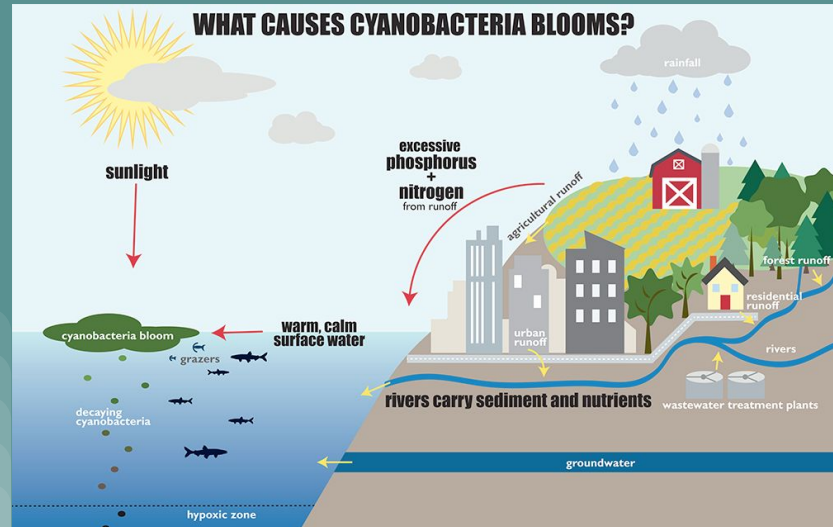
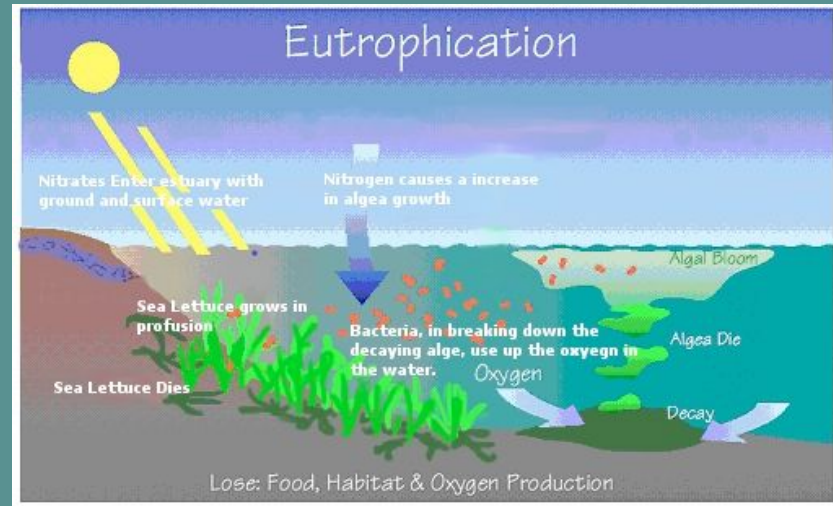
Eutrophication

Natural or human caused

High levels of Nitrogen, Phosphorus and other nutrients cause bacteria and algae overgrowth

Eutrophication uses up all the oxygen, so insects, fish and other organisms cannot survive.
This harms the ecosystem

Runoff from cities and fertilized agriculture can increase the nitrogen levels in bodies of water





Conclusions:

Lithosphere

Biotic

Evaporation

Nitrogen Cycle

Water Cycle

The Greenhouse Effect

Precipitation

Weathering

Abiotic

Biosphere

Erosion

Eutrophication

Infiltration

Carbon Footprint

Atmosphere

Carbon Cycle

GHG (Greenhouse Gas)

Transpiration

Hydrosphere