

2.2 Nutrient Cycles in Ecosystems - Student Notes

- _____ – the flow of nutrients _____ and _____ of the land, ocean, atmosphere and deep rock.
- The health of our ecosystems depends on the balance of:

Carbon, Nitrogen, Phosphorous, Hydrogen and Oxygen

Carbon Cycle:

A. Carbon Facts:

- _____ is found in all living matter.
- Places that carbon is found are called _____ or _____

Short-term Stores

- living things in water & on land
- rotting tissue of plants/animals
- atmosphere (air)
- ocean (dissolved in the water)

Long-term Stores

- underground (oil, gas, natural gas and coal)
- sedimentary rock (limestone)
- ocean floor (old shells)

B. How Carbon Changes Form:

1. _____ (in plants, algae and cyanobacteria)

_____ + _____ + sunlight → _____ + _____

2. _____ (in cells of all living things)

_____ + _____ → _____ + _____ + ENERGY

(energy is used for growth, repair etc.)

3. _____ – done by bacteria/fungi

cellulose → _____

4. Ocean Processes:

- _____ moves _____ around the world
- CO₂ sinks in cold ocean waters → flows to the warm equator and evaporates into the air.

5. _____: (burning, engines, volcanoes, forest fires)

fossil fuels + _____ → _____ + _____ + ENERGY
(oil, gas, natural gas, coal)

Human Activities & CO₂

1. Burning Fossil Fuels

- _____ in atmosphere has increased 30% in past 160 years.
- In the 160,000 years before that, it only increased 1-3%.
- _____ is removed from long-term storage as we mine coal & drill for oil and gas.
- CO₂ is also a _____, (traps heat in atmosphere)

2. Removing Trees

- Trees absorb _____, so when they are cut down, _____ is released into the air.
- Other crops don't remove as much CO₂

Nitrogen Cycle:

A. Nitrogen Facts

- Makes up _____ (muscle function).
- Help plants grow

Where Nitrogen is Found:

- Atmosphere (78% is _____)
- Oceans
- Organic matter in soil
- Lakes, marshes, organisms

B. How Nitrogen Changes Form:

- _____ is not usable by plants or animals, so it has to be converted to other forms.

- Plants can use _____ and _____

1. Nitrogen Fixation

- Lightning changes _____ → _____.
- Rain washes _____ into soil. (small amount)
- _____ in soil (*rhizobium*) & _____ in water change _____ → _____. (more)

2. Nitrification (done by nitrifying bacteria):

_____ → _____ → _____

3. Uptake:

_____ is sucked into plants & used for growth. Herbivores eat plants & use _____ for making proteins & _____.

4. Denitrification (done by _____ bacteria & _____)

_____ → _____

C. Human activities affect the nitrogen cycle.

The amount of nitrogen in the ecosystem has doubled in 50 y. due to:

1. _____ & sewage treatment.
 - NO & _____ are byproducts
2. _____ by burning.
 - acid rain is formed which contains nitric acid (HNO₃).
3. _____
 - _____ & _____ leach into soil & waterways.
 - huge growth in aquatic algae = _____
 - These _____ use up all _____ & _____, block sunlight & produce neurotoxins which poison and kill many aquatic organisms.

Phosphorus Cycle:

Phosphorous Facts

- _____ is a part of the molecule that carries _____ in cells _____.
- Phosphorous helps _____ growth, stem _____ and seed _____.
- In animals, phosphorous is important for _____.

Where Phosphorous is Found:

- Not in atmosphere, but in _____ and sediments on the ocean floor.

B. How Phosphorous Changes Form.

1. _____ (*breaking down rock into smaller pieces*).
 - a) Chemical weathering:
 - acid rain or lichens releases _____
 - b) Physical weathering:
 - wind, water and freezing release the _____
2. _____: plants suck up PO_4^{3-} , then are eaten by animals.
3. _____: Bacteria break down organic matter & phosphorous is returned to soil.
4. _____: when rocks under the ground are
 _____ → _____ → _____

C. Human activities affect the Phosphorous Cycle.

1. _____: increases _____ in ecosystems quickly.
2. _____: turns _____ into ash, which runs into waterways.

How Changes in Nutrient Cycles Affect Biodiversity

To Review:

Any significant changes to any of these nutrients (_____, H, O, _____ or P) can greatly impact _____.

1. _____ → climate change & global warming.
2. Too much _____ can allow certain plant species to out-compete other species.
3. Decreased levels of _____ → slow growth of algae (important producers).