

Biogeochemical cycles and human impacts essay sample



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Biogeochemical Cycles and Human Impacts

The carbon cycle, nitrogen cycle, and phosphorus cycle all play a big role in our environment. They are some of the key components that are recycled to create pathways known as the biogeochemical cycles. All the chemical elements that make up living cells must be recycled continuously in order for the living components of a major ecosystem to survive. The recycling of these elements is the only possible way to maintain a dynamic system. Human impacts of these cycles are very significant and have considerably sped up the processes. (Pearson Education, 2011) Carbon is a nutrient that all organisms need to survive. Carbon is the basic building block of all living things. It moves through an ecosystem in a cycle called the carbon cycle. In this cycle carbon in the atmosphere is known as carbon dioxide. Plants use it to perform photosynthesis and make food. Animals then eat the plants that contained the carbon. Carnivores then eat the other animals thus releasing carbon in animals. Both plants and animals respire. Carbon dioxide is returned to the atmosphere through respiration and decomposition. At one time, carbon was returned to the atmosphere as quickly as it was removed.

However, humans have impacted the carbon cycle with the increased burning of fossil fuels. Deforestation reduces the amount of carbon dioxide being used in photosynthesis and the use of land for agriculture releases carbon dioxide into the environment. Both of which adds carbon to the atmosphere faster than plants can remove it. More recently, reforestation and changed agricultural practices have improved this somewhat. (Pearson Education, 2011) Nitrogen is needed by all organisms to make proteins.

Almost 78% of the atmosphere is nitrogen thus meaning that the main

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reservoir for the nitrogen cycle is the air. This atmospheric nitrogen is called non-reactive nitrogen. This form of nitrogen cannot be used directly by plants or animals. Usually, the nitrogen must be in the form of a chemical called nitrate. The changing of nitrogen to nitrates is called nitrogen fixation. Plants take nitrogen from the soil by absorption through their roots. Plants then use the nitrates that they absorb to make plant proteins. Animals get the nitrogen that they need to make proteins by eating the plants or other animals. When the plants and animals die, bacteria changes the plant or animal's nitrogen content to ammonia. Ammonia is converted to nitrites and then to nitrates by the bacteria.

This process is called nitrification and completes the main part of the cycle.

Many plants are able to use ammonia directly. Therefore, not all of it has to be converted to nitrate before plants can absorb it. When people use synthetic fertilizers on crops such as corn, wheat potatoes, and cotton nitrites or nitrates are added into the soil. This will skip most of the nitrogen cycle and thus the bacteria and microorganisms lose their food source.

Human actions have more than doubled the rate at which nitrogen is moved from the atmosphere to the land. Too much nitrogen in the atmosphere can contribute to ozone depletion, global climate changes, and ozone pollution.

Phosphorus is another one of the essential elements that cycle through the ecosystem. The main reservoir for the phosphorus cycle is in sediments, unlike the nitrogen and carbon cycles, where the main reservoir is in the atmosphere. Phosphorus exists in many rock and soil minerals. As the rock and soil are broken down or eroded, phosphates and other ions are released.

Even though phosphates can move quickly through plants and animals, the processes that move them through the soil and ocean are very slow.

This makes the phosphorus cycle one of the slowest biogeochemical cycles.

Plants absorb phosphate from the soil and incorporate it into organic compounds called organic phosphate. When it comes to food chains, the organic phosphate is transferred from plants to the rest of the ecosystem.

Phosphate is also broken down by respiration and by decomposition.

Phosphate can be released in urine and other waste materials allowing it to be reabsorbed by plants. This will repeat the cycle. Humans have impacted this cycle by mining phosphorus and making it into animal feeds, fertilizers, detergents, as well as other products. Overuse or careless use of phosphorus fertilizers are examples of human interference in the phosphorus cycle. This results in increased amounts of phosphorus as pollutants in bodies of water resulting in eutrophication. Eutrophication devastates water ecosystems by causing overgrowth of algae, too many bacteria, and the death of fish. (The Phosphorus Cycle, 2013) All biogeochemical cycles work together simultaneously to make up the tissues of all living organisms. The absence of humans on earth will not guarantee the stability of biogeochemical cycles but, we must learn to preserve the elements needed to make the pathways for these cycles. (Pidwirny, 2012)

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