



Oceans Connecting a Nation

Student Worksheet: Nitrogen Cycle

Name: _____

Carbon, Nitrogen, and Phosphorous are considered very important to the environment because they are the chemical building blocks for all living organisms. These elements flow or recycle through the biosphere, atmosphere and geosphere through a global process known as Biogeochemical cycling.

The carbon cycle may be the most familiar biogeochemical cycle. As part of the carbon cycle, plants use carbon dioxide for respiration in the photosynthesis process. It is estimated that through respiration, plants in the ocean remove 25 to 50 billion metric tons of carbon from the air every year. Using this carbon to live and grow, plants serve another important role as the base level of the food web.

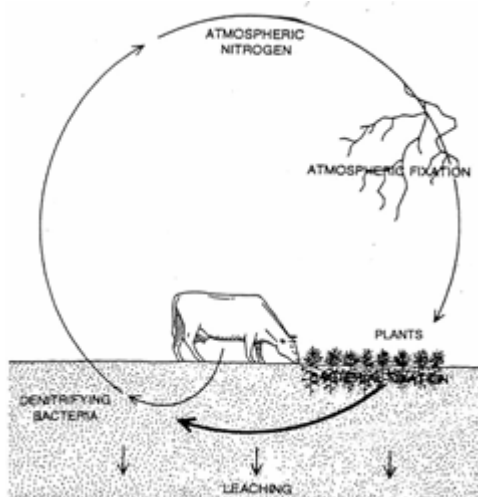
Nitrogen and the nitrogen cycle play an important role in making life on Earth possible. For example, the atmosphere is 79% nitrogen gas (N_2), and nitrogen is a basic element needed for all living things to grow.

Procedure

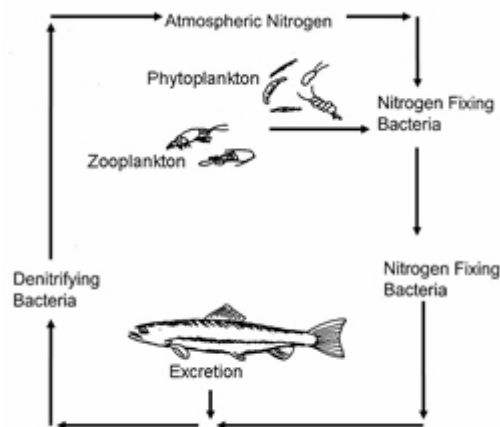
Part 1 - Role of nitrogen in growth

1. Although we are surrounded by nitrogen gas, and organisms need nitrogen to live, most organisms cannot use the nitrogen gas (N_2) found in the air. Nitrogen must be combined with other elements, such as Hydrogen, to be usable by organisms. The process of nitrogen combining with other elements is called nitrogen fixation. The process can be performed by a special type of bacteria that grows on the roots of certain plants, or a lightning bolt can split the two nitrogen atoms, allowing the "free" nitrogen atoms to react with oxygen and hydrogen atoms. These two natural processes produce limited amounts of nitrogen in the environment.

Compare the diagrams of the terrestrial and ocean nitrogen cycle and answer the questions below.



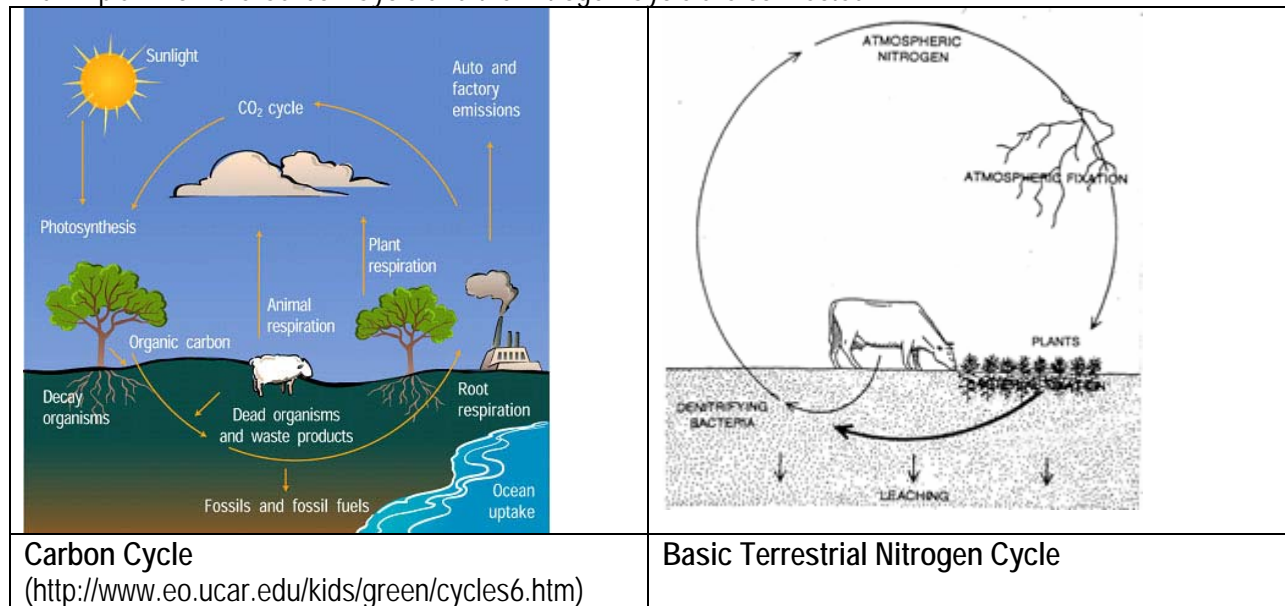
Basic Terrestrial Nitrogen Cycle



Basic Ocean Nitrogen Cycle

1a. Describe how the land and ocean nitrogen cycles are similar.

1b. Explain how the Carbon Cycle and the Nitrogen Cycle are connected.



1c. What do you think would happen to the environment if all of the nitrogen fixing bacteria in the ocean died?

Part 2 - Limiting Factor

What does a plant need to live? Sunlight, water, nutrients (nitrogen, phosphorous, iron, etc.) and proper temperature were most likely the responses to the question. These are the basic requirements for both land and water based plants because they are needed for the photosynthesis process. These requirements can also be limiting factors. A limiting factor is an environmental factor that prevents a population from increasing.

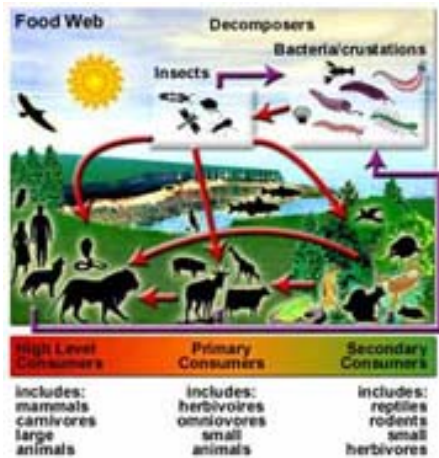
2a. Explain what happens to a plant if it does not get enough sunlight, water or nutrients.

2b. Explain what happens to a plant if it gets too much sunlight, water or nutrients.

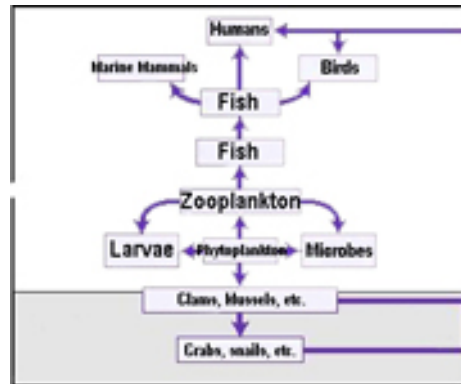
2c. Explain why you think naturally available nitrogen is the main limiting nutrient for plants.

Part 3 - Food chain

Plants, both land and water based, serve as the base level of the food chain and are called producers. The producers support the higher levels of the food chain. Compare the following diagrams of the terrestrial and ocean food webs and answer the questions below.



Terrestrial Food Web
(www.globalchange.umich.edu)



Ocean Food Web
(www.waterencyclopedia.com)

3a. What would happen to the terrestrial food web if all the plants died?

3b. What would happen to the ocean food web if all the phytoplankton died?

Assessment

1. What are limiting factors for humans?
2. What would happen if all the plants died? Would humans be affected? Explain.
3. What if the human population increased quickly? Would plants be affected? Explain.
4. What do you think might happen if too much nitrogen and other nutrients were released into the environment?