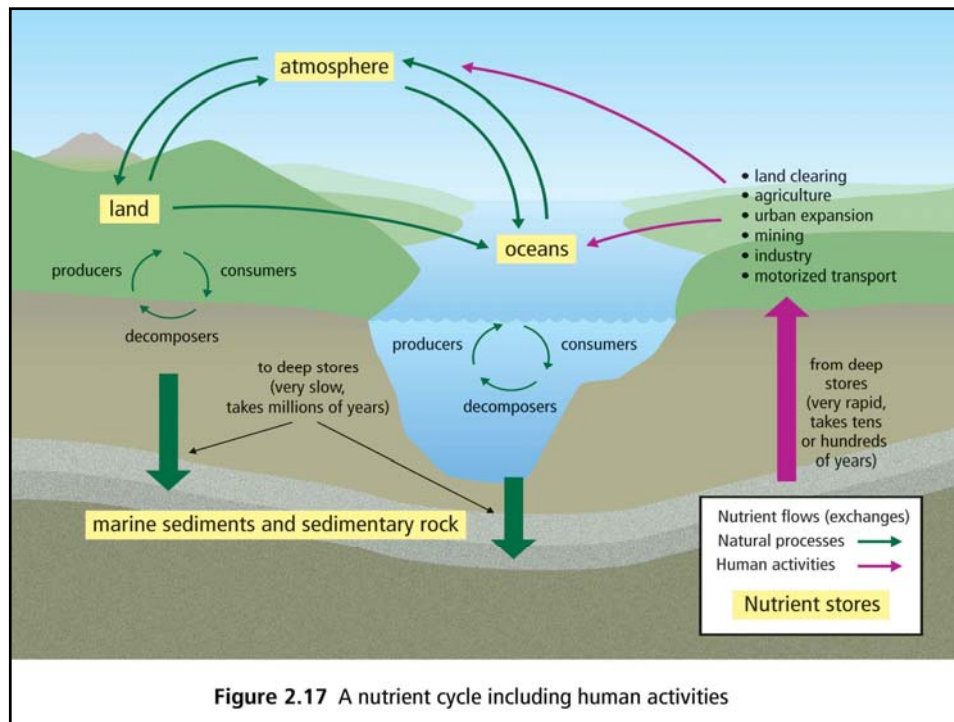


## Ch 2 Energy Flow and Nutrient Cycle wkst

This worksheet takes the place of  
Workbook pages 25,26,27,28

1. What types of human activities affect a nutrient cycle?



1. What types of human activities affect a nutrient cycle?

Land clearing, agriculture, urban expansion, mining, industry, and motorized transportation.

2. How do these human activities affect a nutrient cycle?

They increase the amounts of nutrients in a cycle faster than the natural processes can move them back into stores.

3. How do changes in nutrient cycles affect biodiversity?

Changes in the carbon, nitrogen and phosphorus cycles can affect the health and variety of organisms that live in an ecosystem.

4. What are the deep stores of nutrients and how long does it take to return the nutrients in deep stores back into surface ecosystems?

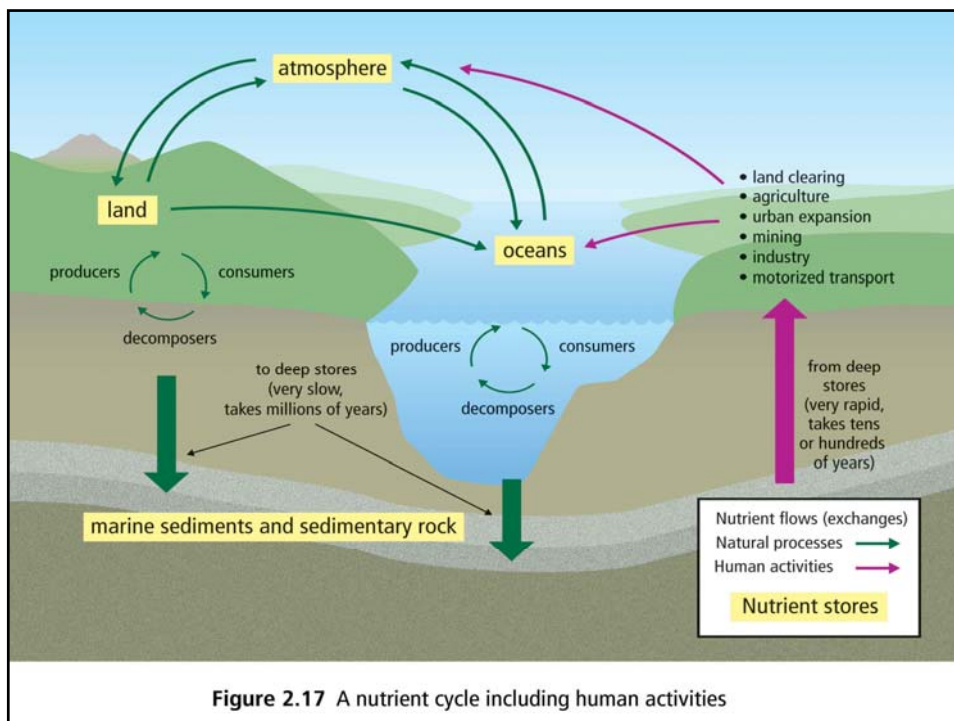


Figure 2.17 A nutrient cycle including human activities

4. What are the deep stores of nutrients and how long does it take to return the nutrients in deep stores back into surface ecosystems?

Marine sediments and sedimentary rock

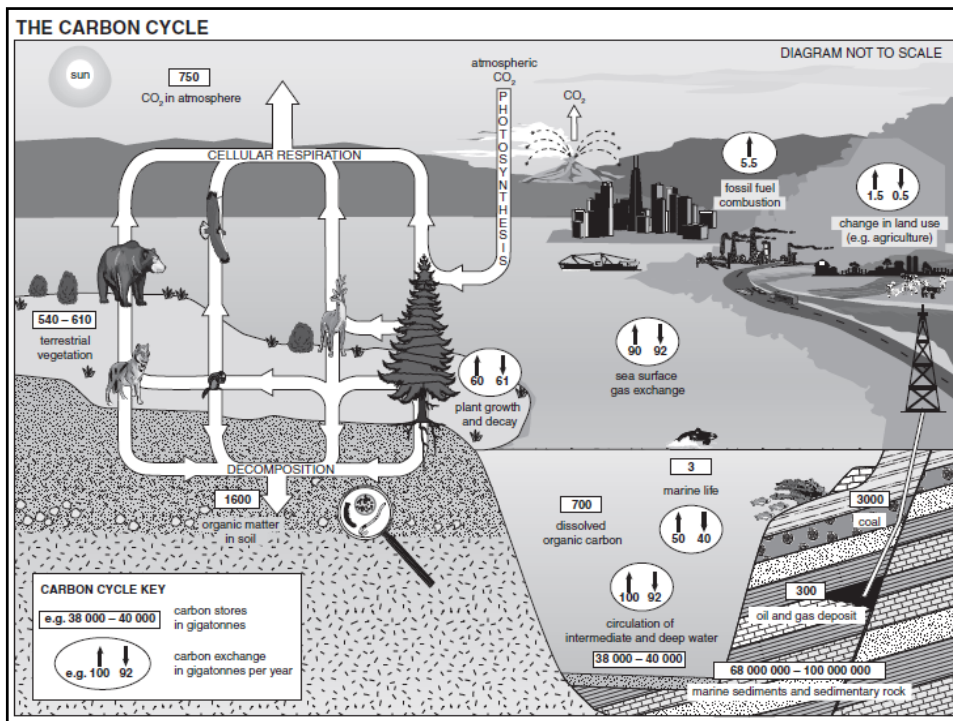
Very slow, may take millions of years.

5. Why is the carbon cycle important for living things?

Cellular respiration is the reaction that provides energy for all living things.

Photosynthesis brings the carbon dioxide back into the organisms from the atmosphere.

6. What are some short term stores of carbon?



6. What are some short term stores of carbon?

Atmosphere

Terrestrial organisms (vegetation)

Organic matter in the soil

Marine life

Dissolved organic carbon

7. What are some long term stores of carbon?

Marine sediments and sedimentary  
rock

Oil and gas deposits

Coal

Dissolved carbon dioxide in deeper  
water

8. What are some processes that cycle carbon?

Photosynthesis

Respiration

Decomposition

Ocean processes

Volcanic eruptions

Forest fires (not seen on diagram)

9. What is the amount of carbon stored in:

a. Atmosphere

750 gigatonnes

(=750 000 000 000 TONS)

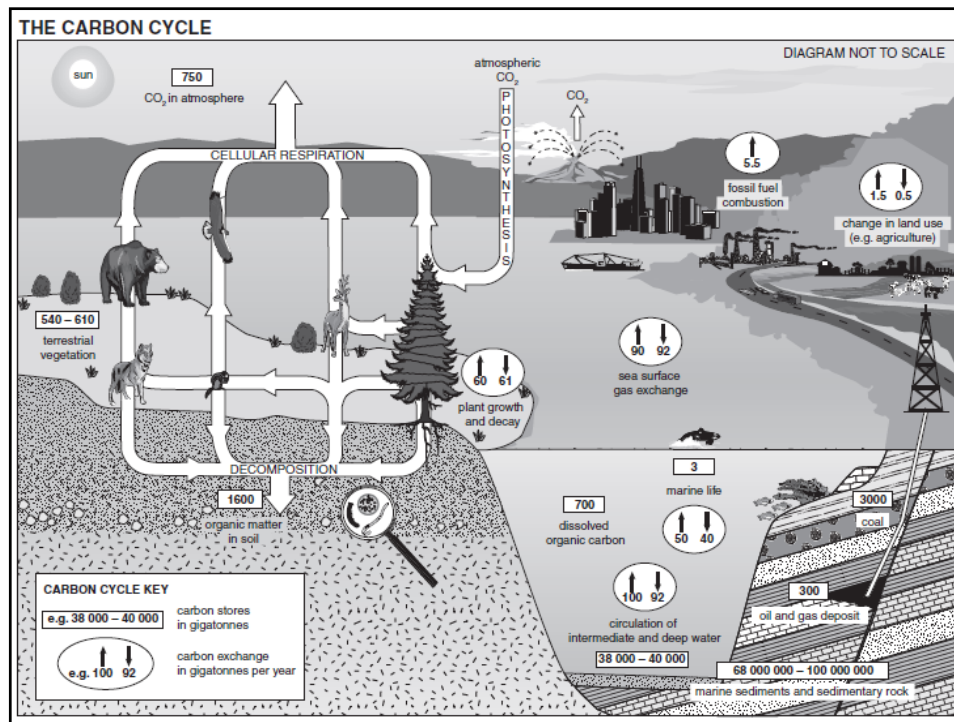
b. Coal deposits

3000 gigatonnes

c. Marine sediments and sedimentary rock

68 000 000 to 100 000 000 gigatonnes





10. What is the amount of carbon exchanged and is more going into storage or out into the environment?

Example Marine life

50 gigatonnes out into environment per year

40 gigatonnes into stores per year

Thus 10 gigatonnes overall going into the environment per year

a. Plant growth and decay

60 out 61 in

Difference of 1 gigatonne per year into stores.

b. Sea surface gas exchange

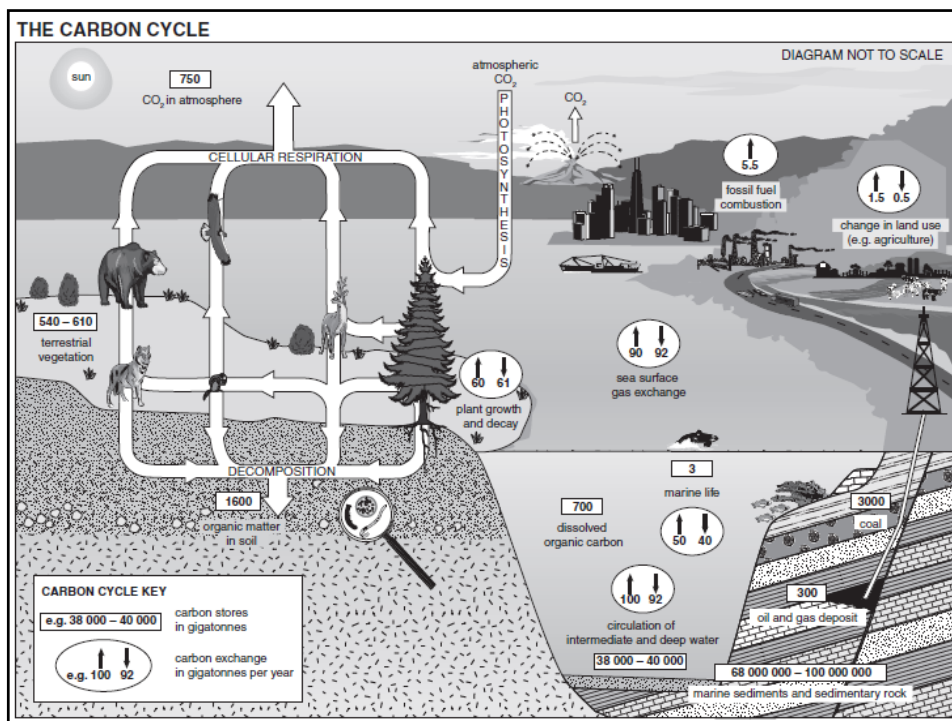
90 out 92 in

Difference of 2 gigatonnes going into stores per year

c. Circulation of intermediate and deep water

100 out 92 in

Difference of 8 gigatonnes going out into environment per year.



d. Change in land use

1.5 out 0.5 in

Difference of 1 gigatonne of carbon going out into the environment.

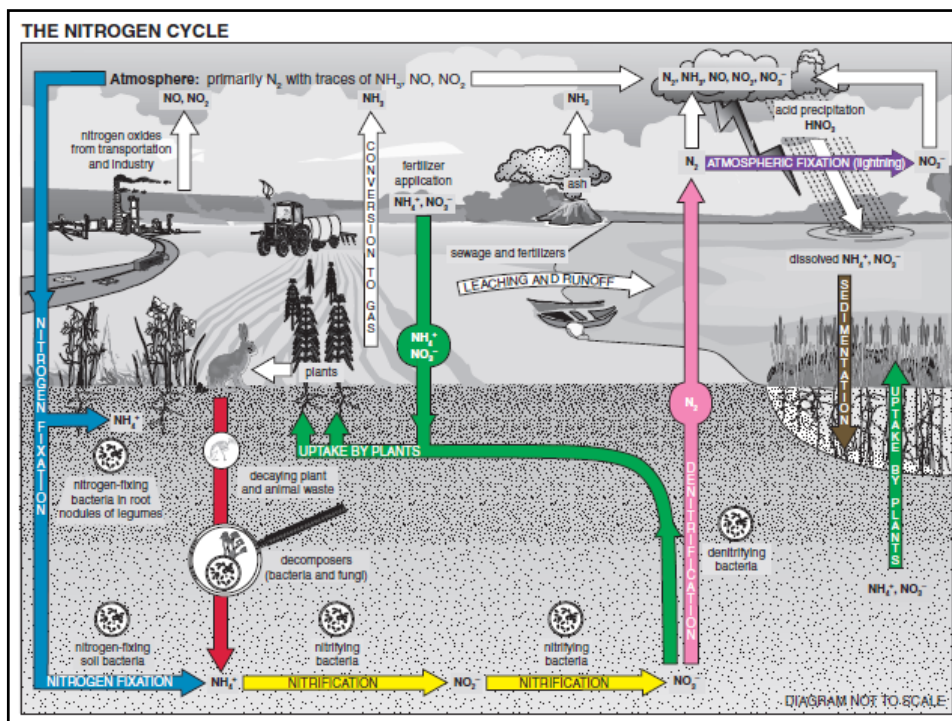
e. Fossil fuel combustion

5.5 going out 0 going into stores

Difference of 5.5 gigatonnes of carbon going out into environment.

11. Why is the nitrogen cycle important?

Nitrogen is a component of DNA, proteins, muscle function in animals, growth in plants, etc.



12. How is nitrogen stored?

Nitrogen gas in atmosphere

Oceans

Organic matter in soil

All living organisms have nitrogen

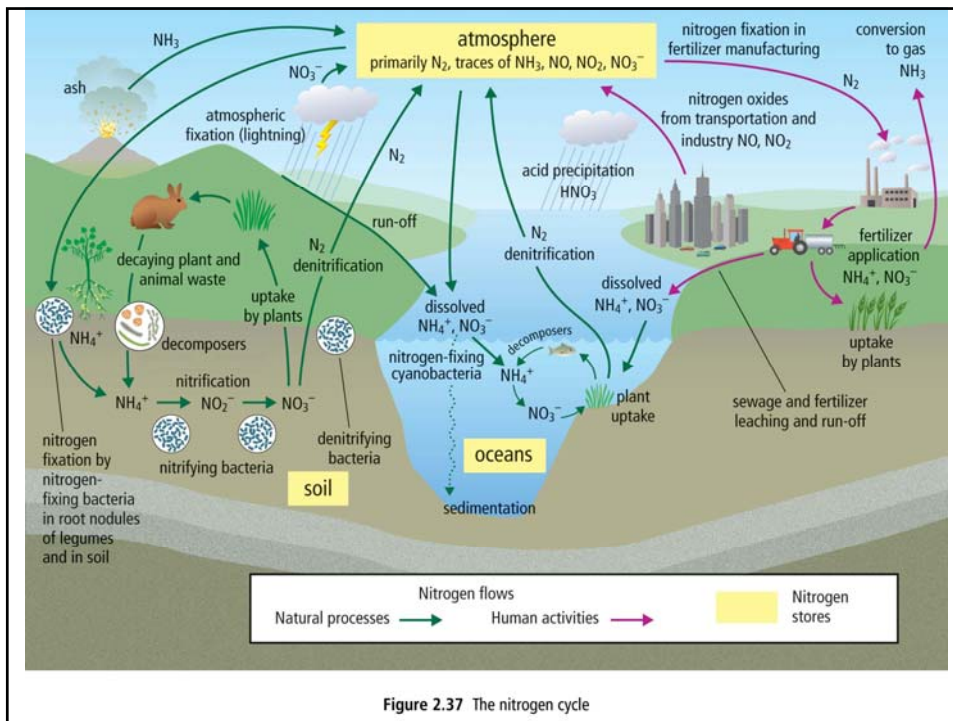


Figure 2.37 The nitrogen cycle

13. What are some processes that cycle nitrogen?

Nitrogen fixation  
 nitrification  
 Uptake by plants  
 Denitrification  
 sedimentation

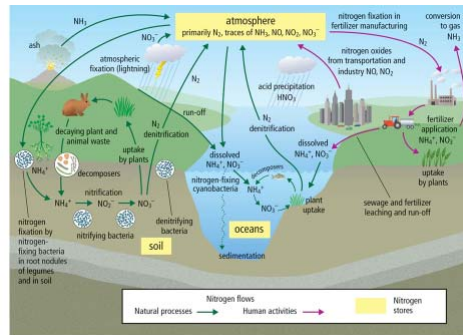
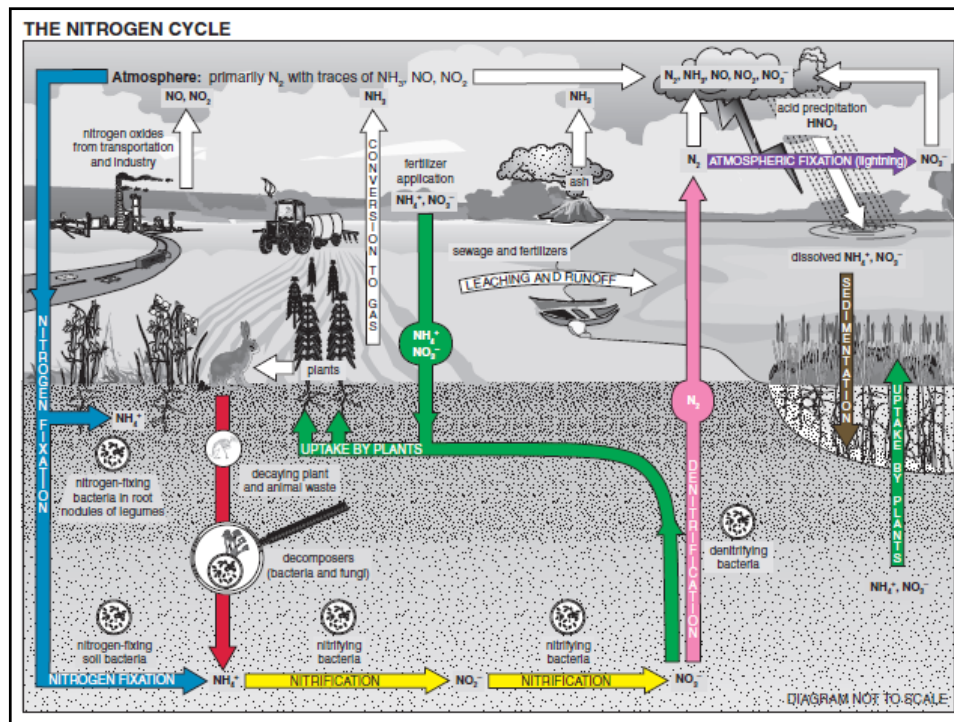


Figure 2.37 The nitrogen cycle

14. What is the term used to describe atmospheric nitrogen being converted to  $NH_4^+$  by bacteria?

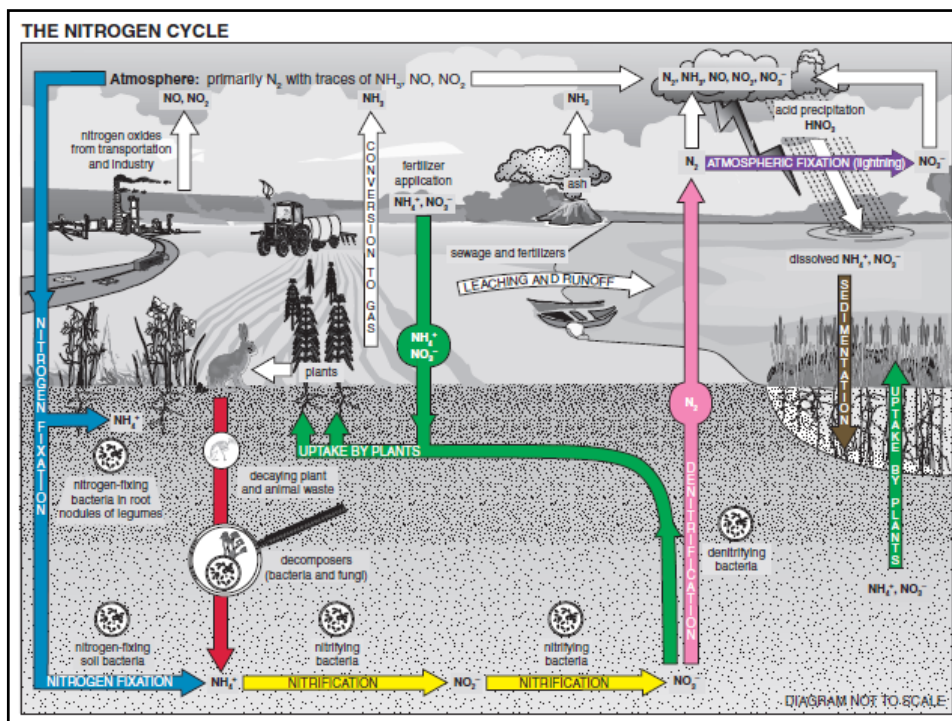


14. What is the term used to describe atmospheric nitrogen being converted to  $NH_4^+$  by bacteria?

Nitrogen fixation



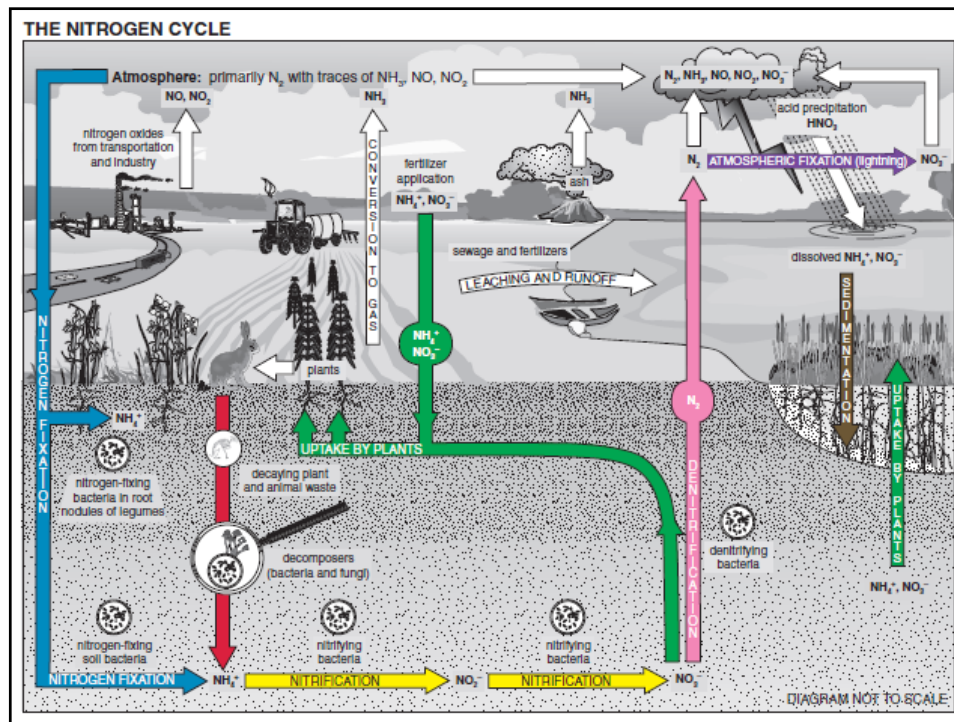
15. What is the term used to describe  $\text{NH}_4^+$  being turned into  $\text{NO}_2^-$  and  $\text{NO}_3^-$  by bacteria?



15. What is the term used to describe  $\text{NH}_4^+$  being turned into  $\text{NO}_2^-$  and  $\text{NO}_3^-$  by bacteria?

**Nitrification**

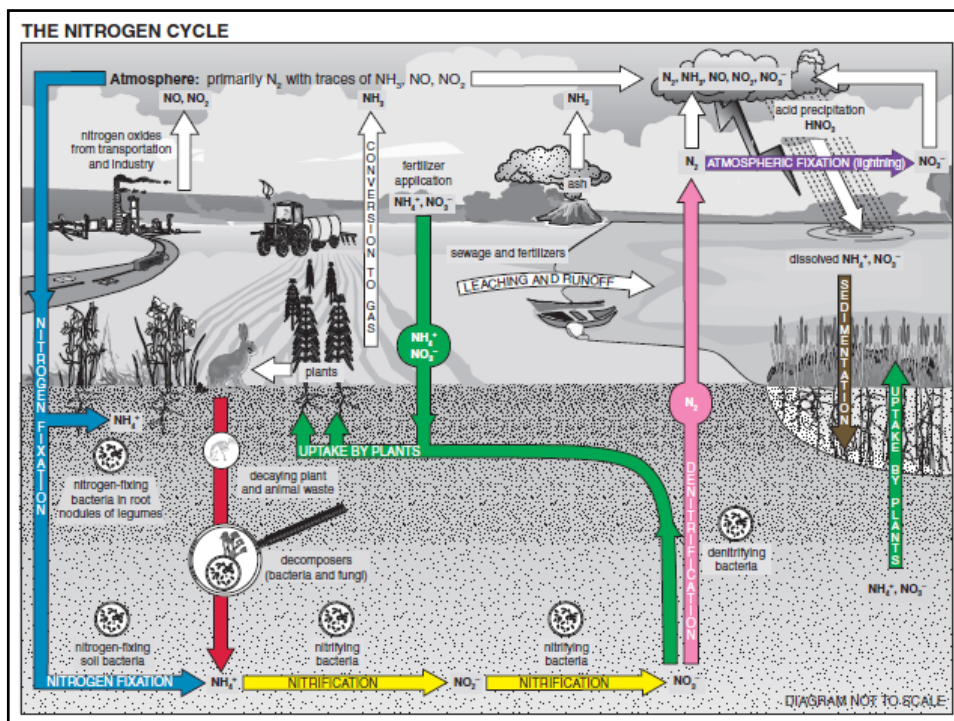
16. What is the term used to describe the removal of sewage and fertilizer compounds by ground water or rainwater and washes them into creeks, streams and lakes?



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Leaching and runoff

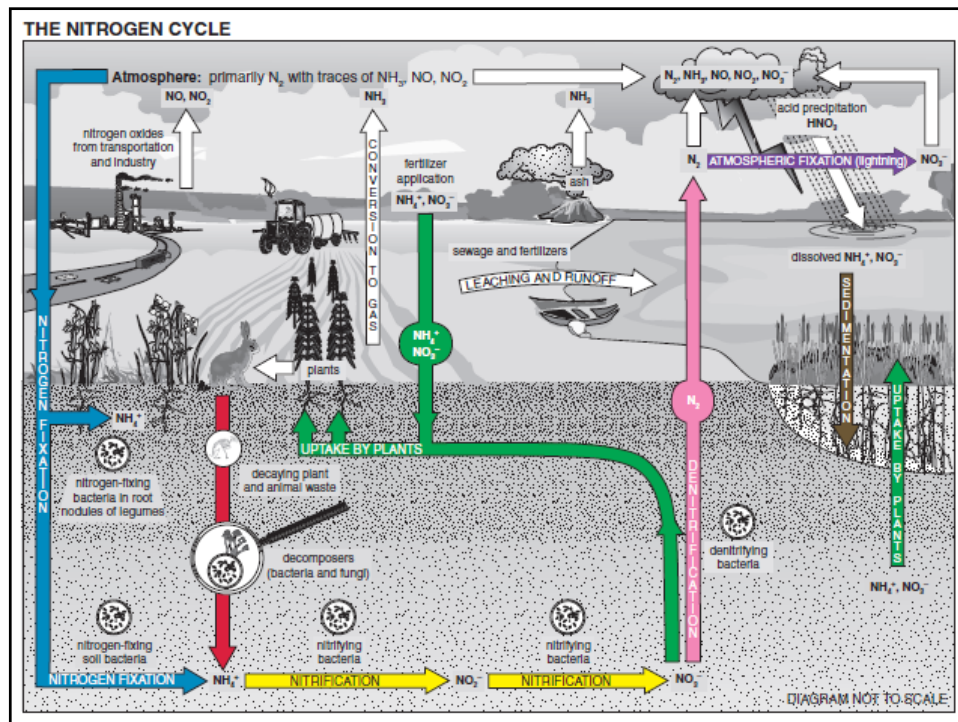
17. What is the term used to describe nitrates  $\text{NO}_3^-$  being converted into atmospheric nitrogen gas?



17. What is the term used to describe nitrates  $\text{NO}_3^-$  being converted into atmospheric nitrogen gas?

Denitrification

18. What process turns atmospheric nitrogen  $\text{N}_2$  into nitrates?



18. What process turns atmospheric nitrogen  $N_2$  into nitrates?

Atmospheric fixation or lightning

19. Name some human activities that affect the nitrogen cycle.

Transportation and industry

Agriculture / fertilizing

Fossil fuel combustion

Sewage treatment

Clearing forests grassland burning

20. Why is the phosphorus cycle important?

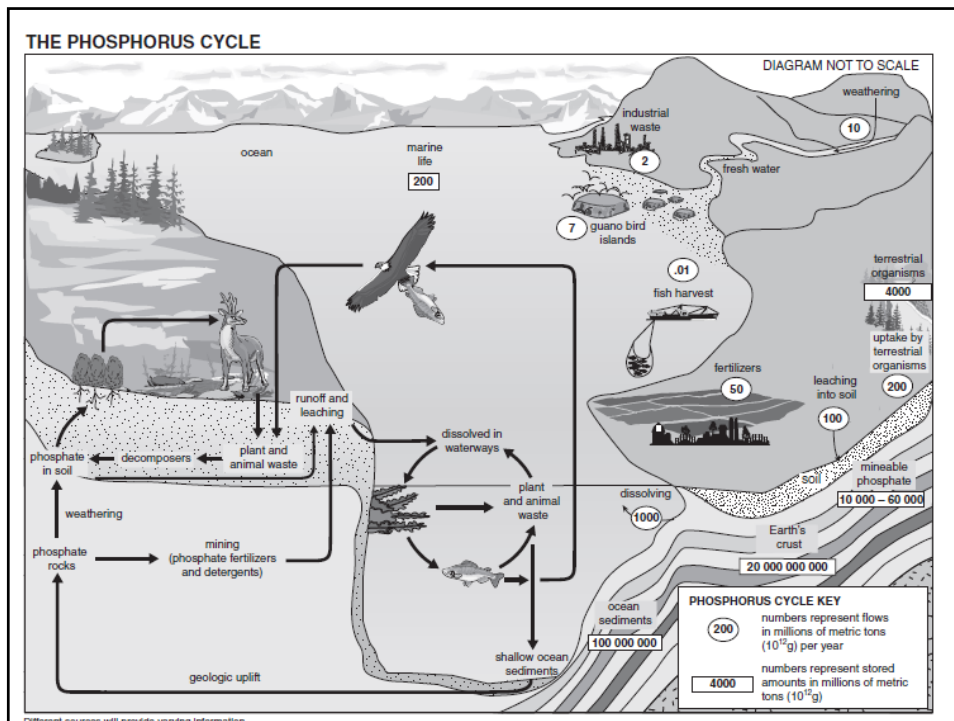
Involved in the energy molecule in plants and animals

Root development in plants

Bone structure in animals

21. How much phosphorus is stored in millions of metric tons in the following:

- a. Marine life
- b. Terrestrial organisms
- c. Ocean sediments
- d. Earth's crust



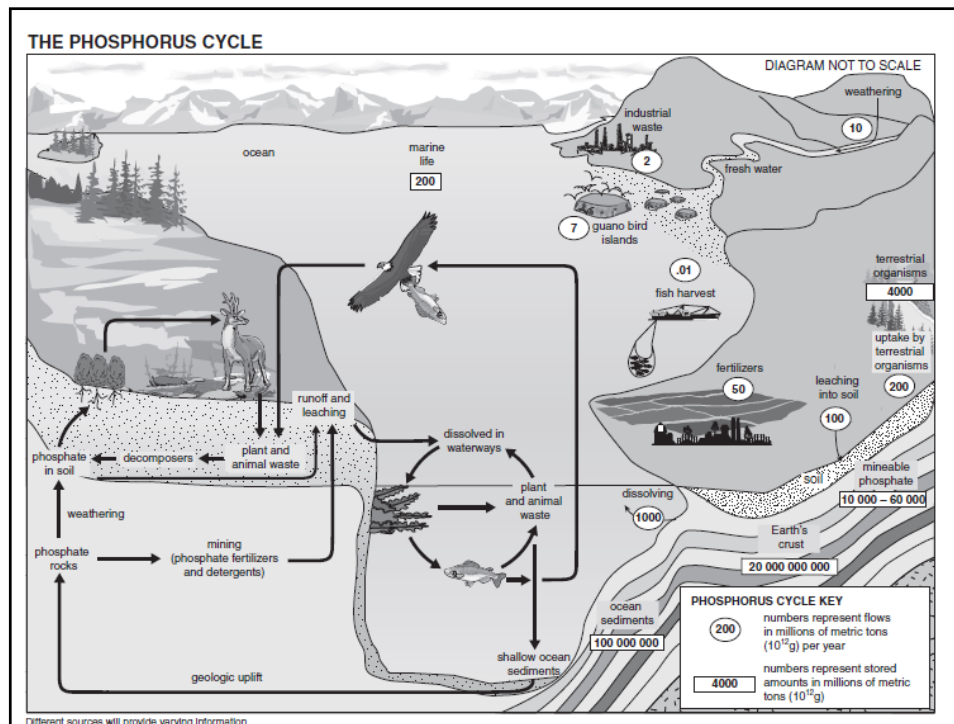


21. How much phosphorus is stored in millions of metric tons in the following:

- |                          |  |
|--------------------------|--|
| a. Marine life           | 200 million metric tons<br>(200 000 000) |
| b. Terrestrial organisms | 4000                                     |
| c. Ocean sediments       | 100 000 000                              |
| d. Earth's crust         | 20 000 000 000                           |

22. How much phosphorus in millions of metric tons is returned by:

- Uptake by terrestrial organisms
- Bird guano islands
- Dissolving
- weathering

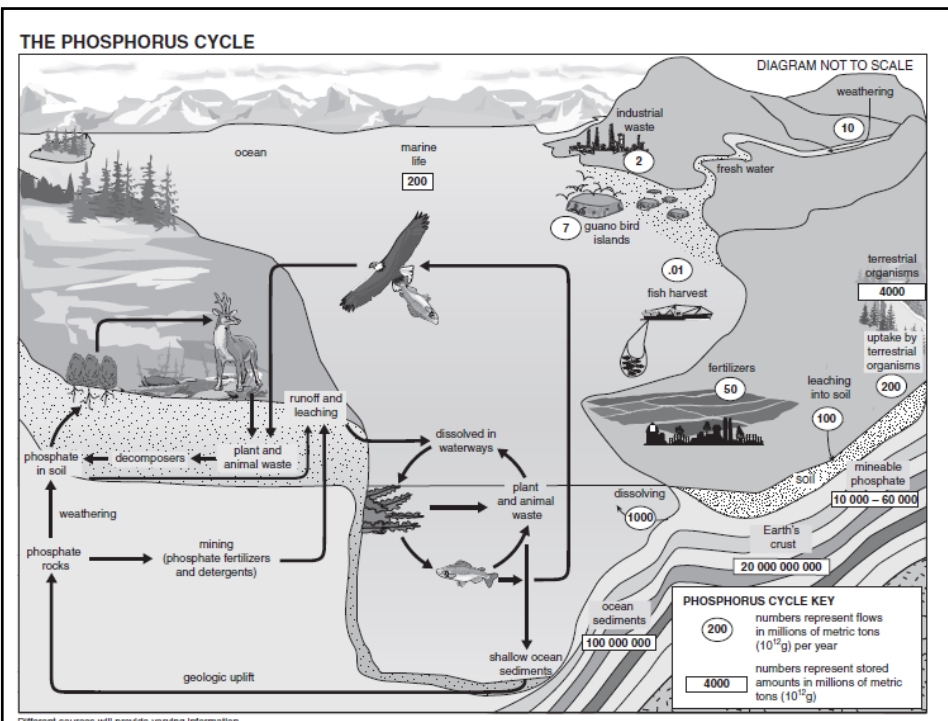


22. How much phosphorus in millions of metric tons is returned by:

- |                                    |      |
|------------------------------------|------|
| a. Uptake by terrestrial organisms | 200  |
| b. Bird guano islands              | 7    |
| c. Dissolving                      | 1000 |
| d. Weathering                      | 10   |

200 million metric tons = 200 000 000 tons

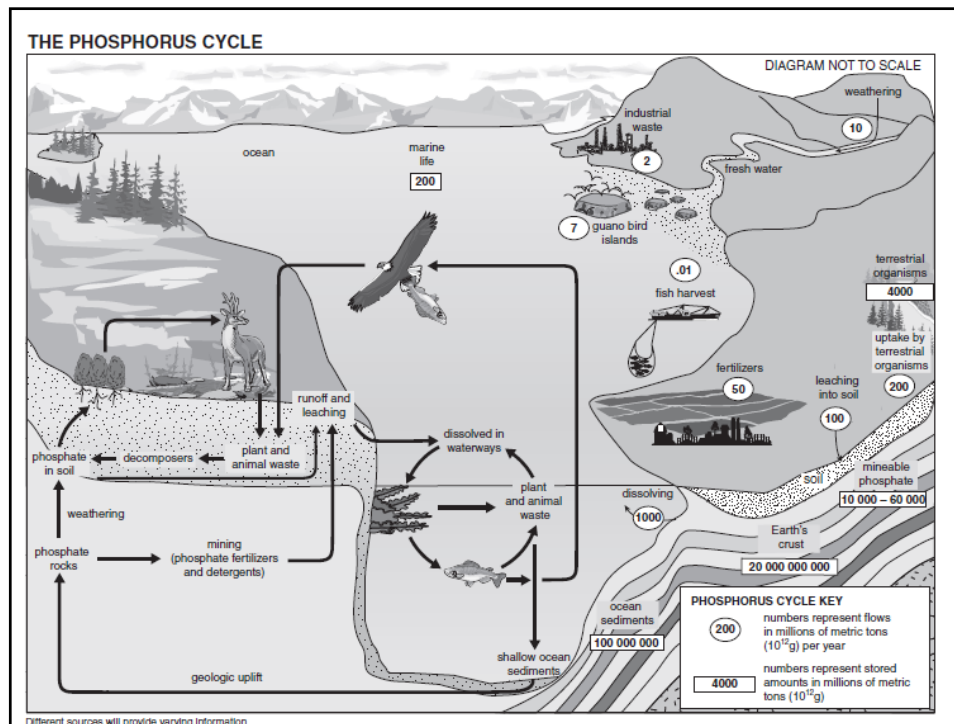
23. Name the process that brings deep phosphate rocks closer to the surface.



23. Name the process that brings deep phosphate rocks closer to the surface.

**Geologic uplift**  
**(or mining from humans)**

24. Name the process that converts phosphorus in the rocks (phosphates) to phosphates in the soil.



24. Name the process that converts phosphorus in the rocks (phosphates) to phosphates in the soil.

**Weathering (and erosion)**

25. Name some human activities that affect the phosphorus cycle.

From diagram:

Fertilization from agriculture

From book:

Detergents, mining