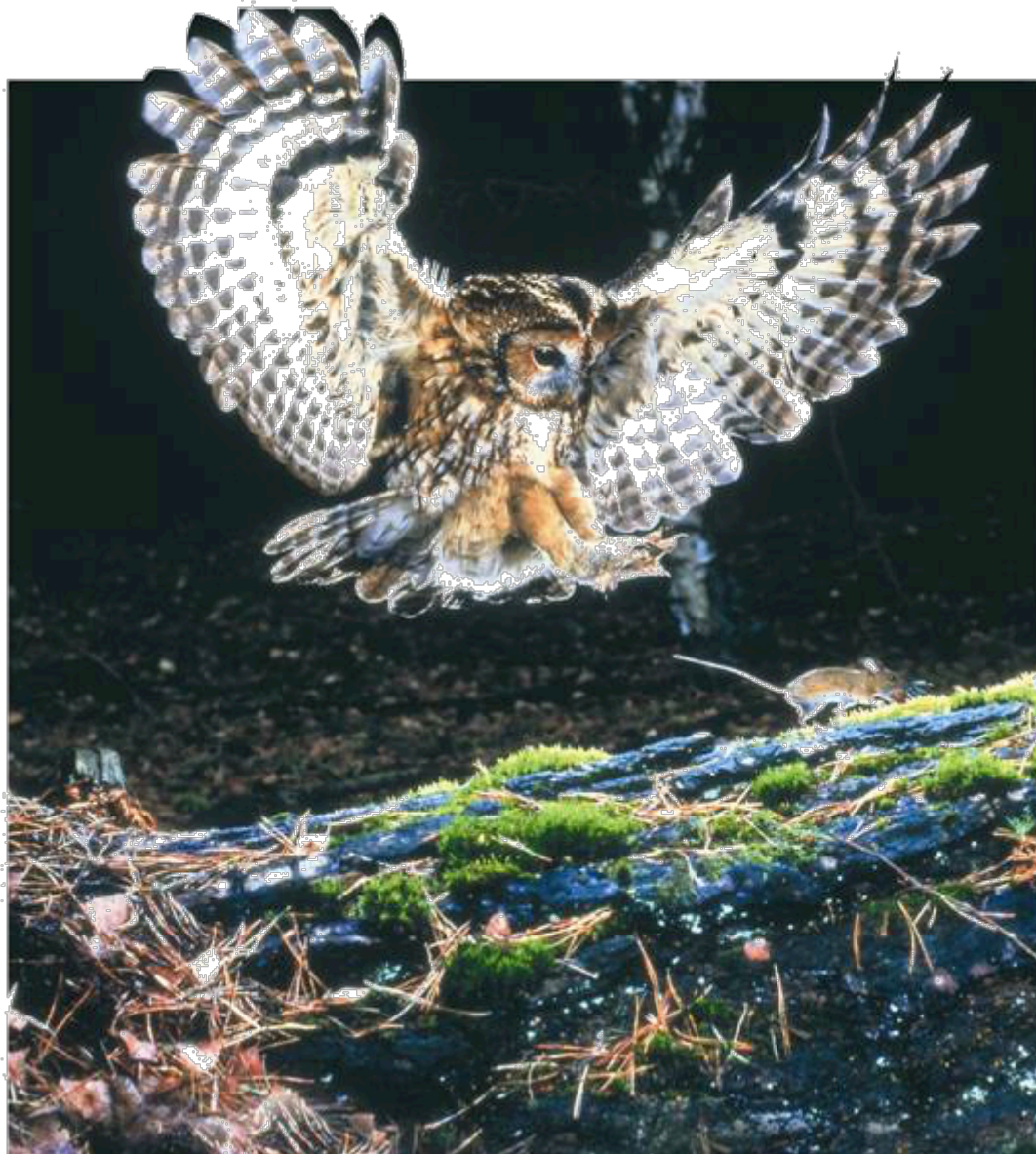




3–3 Cycles of Matter





How does matter move among the living and nonliving parts of an ecosystem?

Recycling in the Biosphere

Energy and matter move through the biosphere very differently.



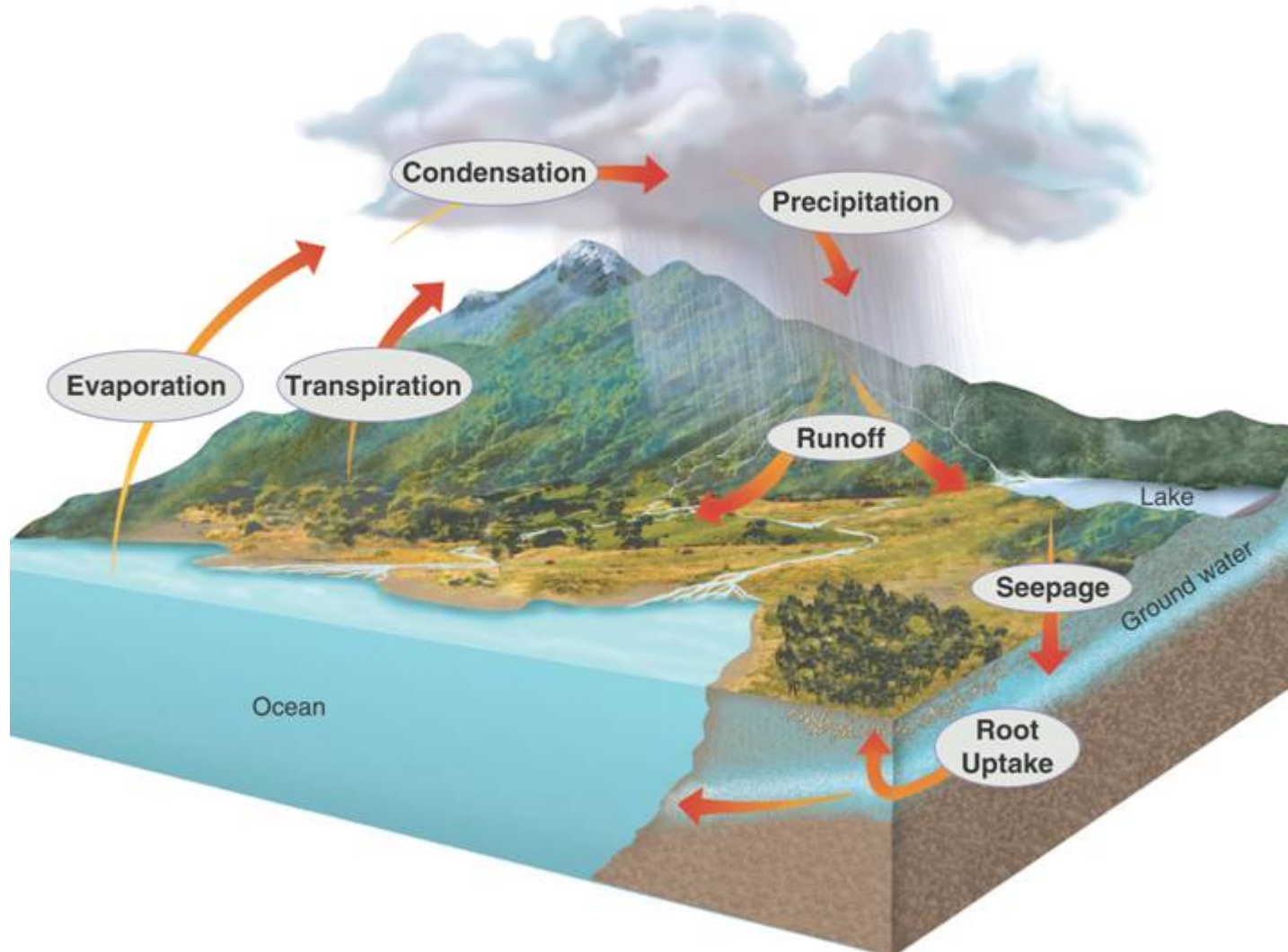
Unlike the one-way flow of energy, matter is recycled within and between ecosystems.

Biogeochemical Cycles

The Water Cycle

All living things require water to survive.

Water moves between the ocean, atmosphere, and land.





How are nutrients important in living systems?

Nutrient Cycles

All the chemical substances that an organism needs to sustain life are its **nutrients**.



Every living organism needs nutrients to build tissues and carry out essential life functions.

Similar to water, nutrients are passed between organisms and the environment through biogeochemical cycles.

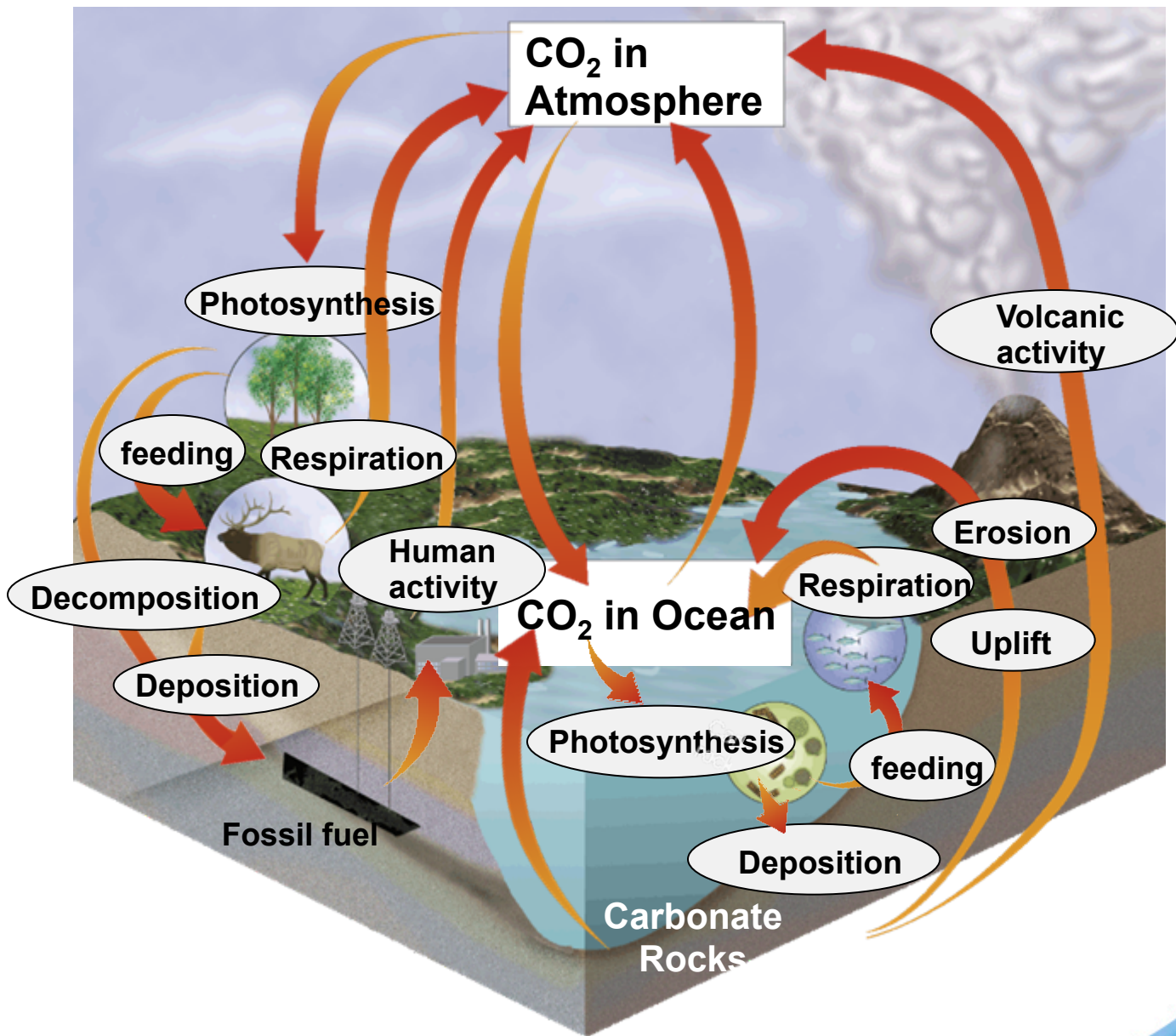
The Carbon Cycle

Carbon is a key ingredient of living tissue.

Biological processes, such as photosynthesis, respiration, and decomposition, take up and release carbon and oxygen.

Geochemical processes, such as erosion and volcanic activity, release carbon dioxide to the atmosphere and oceans.

3-3 Cycles of Matter → Nutrient Cycles



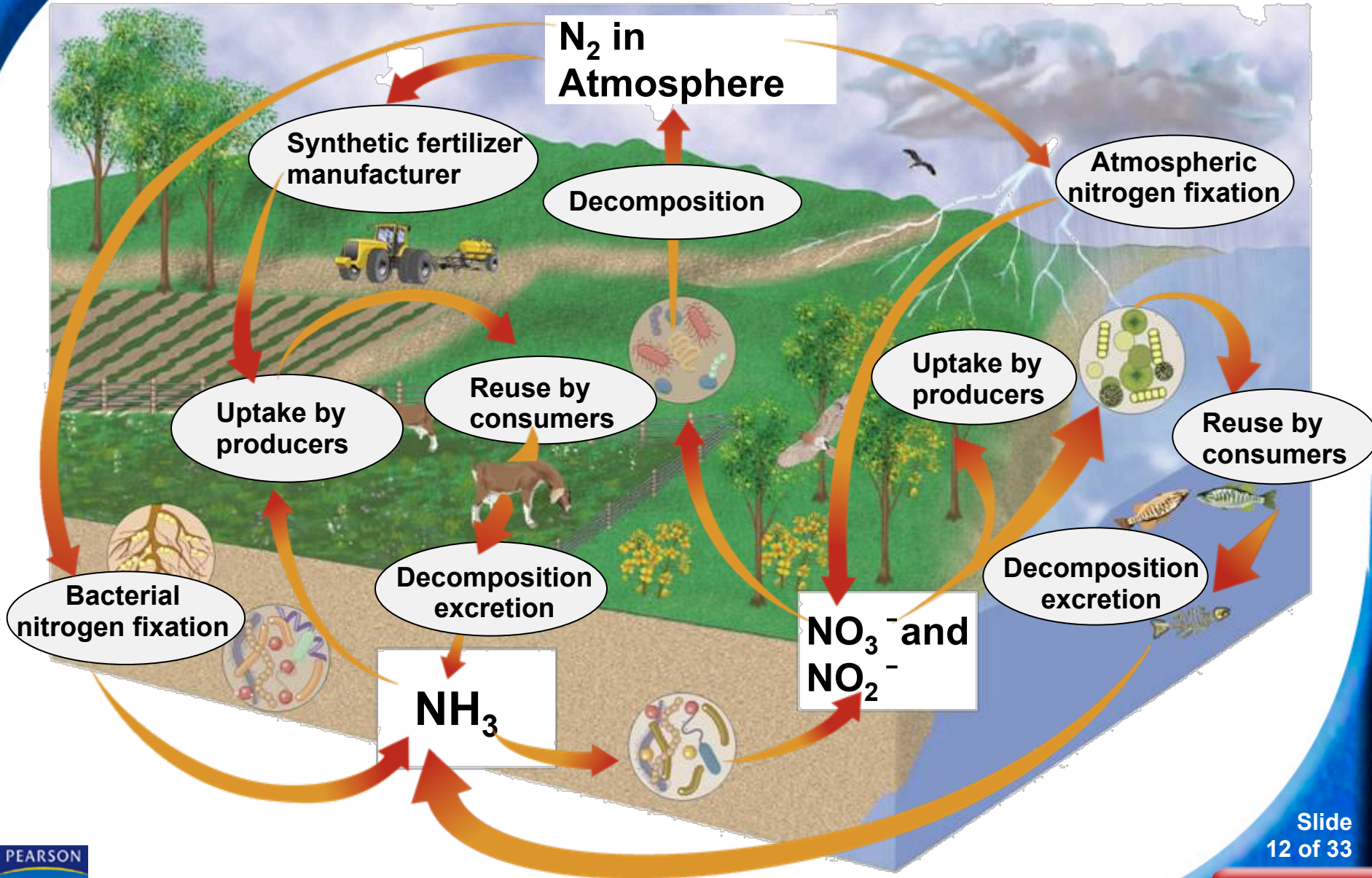
The Nitrogen Cycle

All organisms require nitrogen to make proteins.

Although nitrogen gas is the most abundant form of nitrogen on Earth, *only certain types of bacteria can use this form* directly.

Such bacteria live in the soil and on the roots of plants called legumes. They convert nitrogen gas into ammonia in a process known as **nitrogen fixation**.

3-3 Cycles of Matter → Nutrient Cycles



Other soil bacteria convert nitrates into nitrogen gas in a process called **denitrification**.

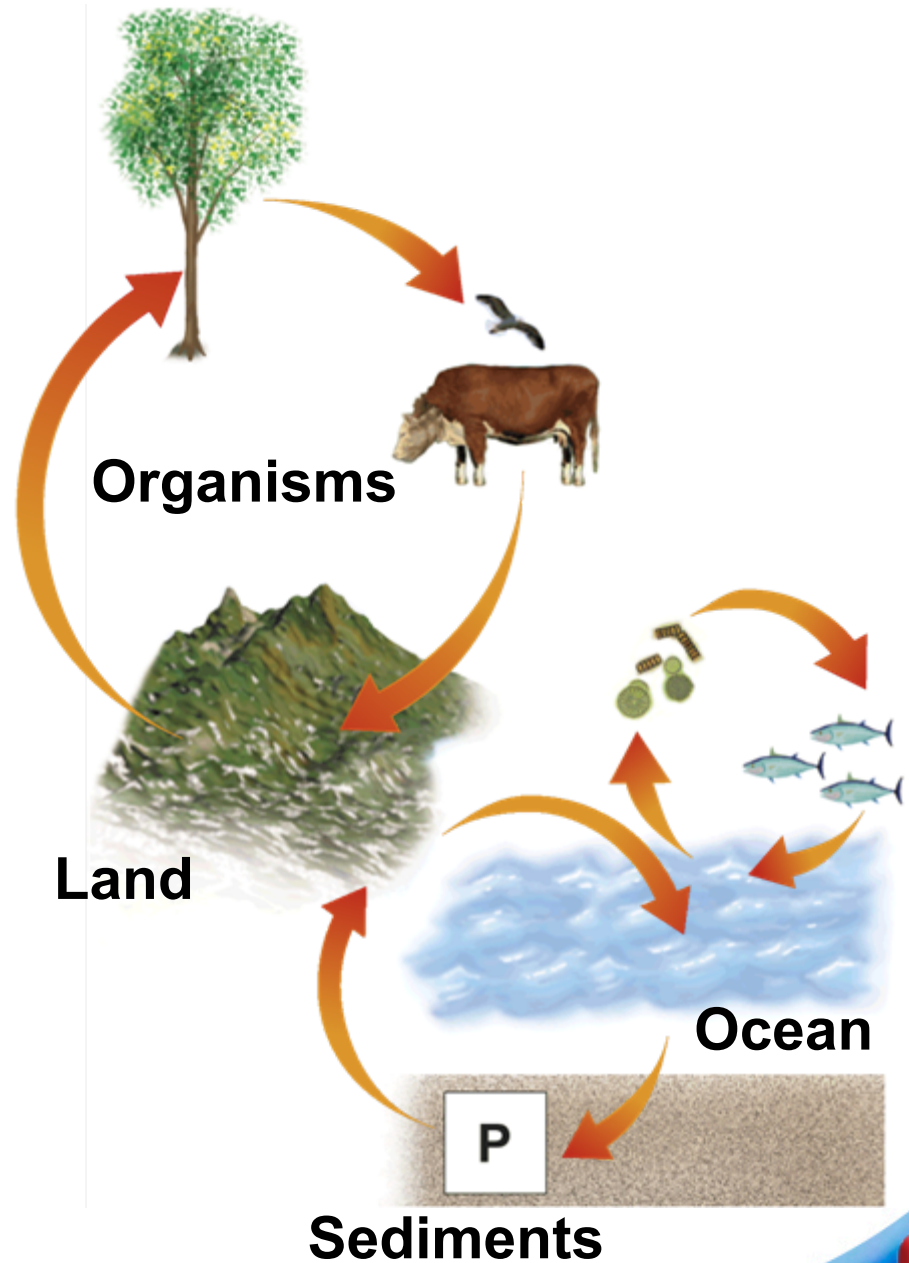
This process releases nitrogen into the atmosphere once again.

The Phosphorus Cycle

Phosphorus is essential to organisms because it helps forms important molecules like **DNA** and **RNA**.

Most phosphorus exists in the form of inorganic phosphate. Inorganic phosphate is released into the soil and water as sediments wear down.

Organic phosphate moves through the food web and to the rest of the ecosystem.



Nutrient Limitation

The **primary productivity** of an ecosystem is the rate at which organic matter is created by producers.

One factor that controls the primary productivity of an ecosystem is the amount of available nutrients.

If a nutrient is in short supply, it will limit an organism's growth.

When an ecosystem is limited by a single nutrient that is scarce or cycles very slowly, this substance is called a **limiting nutrient**.

When an aquatic ecosystem receives a large input of a limiting nutrient—such as runoff from heavily fertilized fields—the result is often an immediate increase in the amount of algae and other producers.

This result is called an **algal bloom**.

Algal blooms can disrupt the equilibrium of an ecosystem.

3-3 Section QUIZ

Continue to:

Section QUIZ

- or -

Click to Launch:



3-3 Section QUIZ

- 1 Transpiration is part of the
- a. water cycle.
 - b. carbon cycle.
 - c. nitrogen cycle.
 - d. phosphorus cycle.

3-3 Section QUIZ

- 2 Carbon is found in the atmosphere in the form of
- a. carbohydrates.
 - b. carbon dioxide.
 - c. calcium carbonate.
 - d. ammonia.

3-3 Section QUIZ

- 3** Biologists describe nutrients as moving through cycles because the substances
- start as simple organic forms that plants need.
 - provide “building blocks” and energy that organisms need.
 - are passed between organisms and the environment and then back to organisms.
 - are needed by organisms to carry out life processes.

3-3 Section QUIZ

4 The only organisms that can convert nitrogen in the atmosphere into a form useful to living things are nitrogen-fixing

- a. plants.
- b. bacteria.
- c. detritivores.
- d. animals.

3-3 Section QUIZ

- 5** When an aquatic ecosystem receives a large input of a limiting nutrient, the result is
- a. runoff.
 - b. algal death.
 - c. algal bloom.
 - d. less primary productivity.

END OF SECTION