

Ecosystems

1. Energy Flow

2. Chemical cycles

water, carbon, nitrogen

3. Human effects on cycles

eutrophication, acid rain

-
- Ecosystem = community plus abiotic factors
 - Conditions (temp, light)
 - Resources (water, nutrients)
 - Energy flows from the sun, through plants, animals, and decomposers, and is lost as heat
 - Chemicals are recycled between air, water, soil, and organisms

- A terrarium ecosystem / Biosphere II

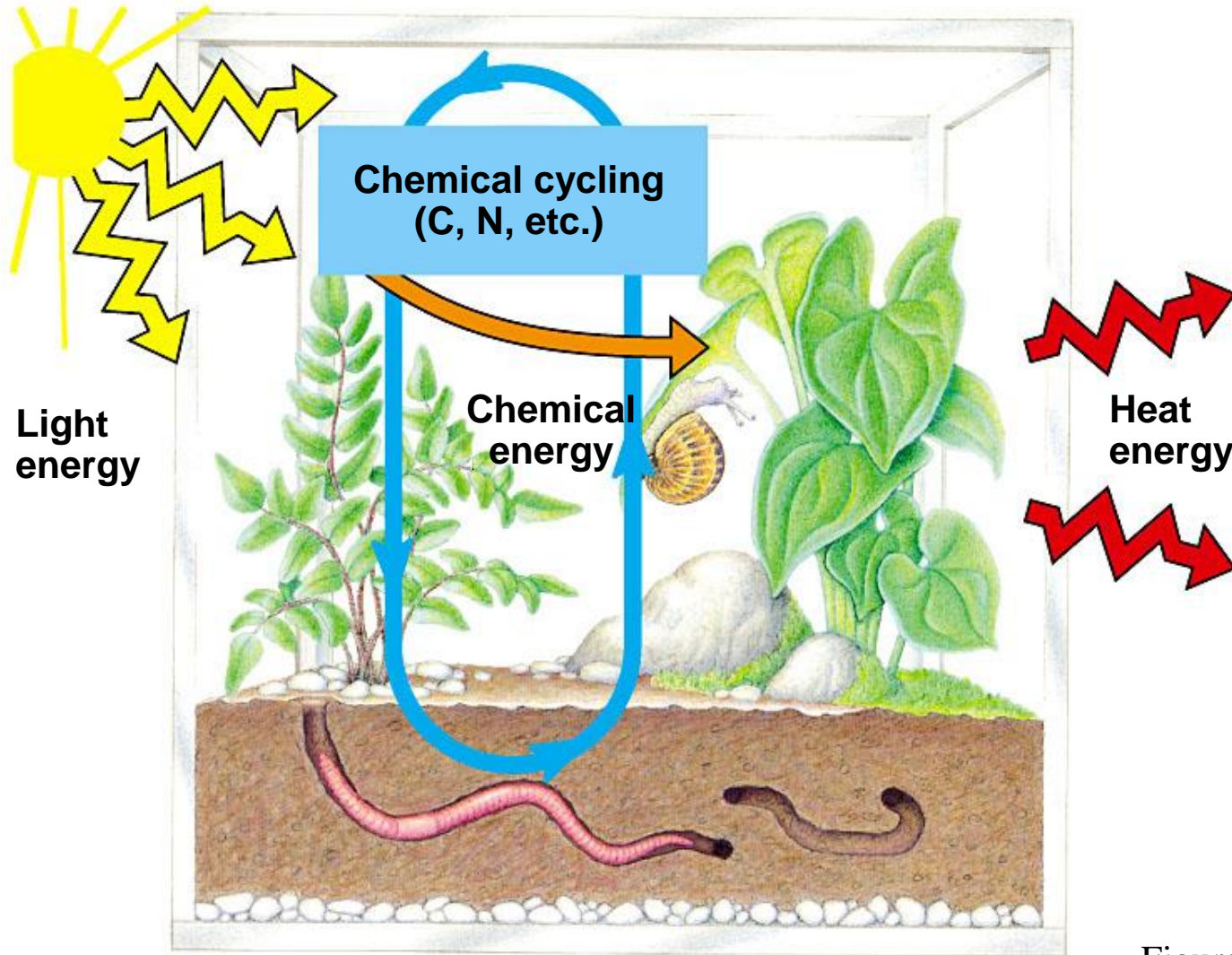


Figure 36.8

Chemicals are recycled between organic matter and abiotic reservoirs

- Water cycle
- Carbon cycle
- Nitrogen cycle

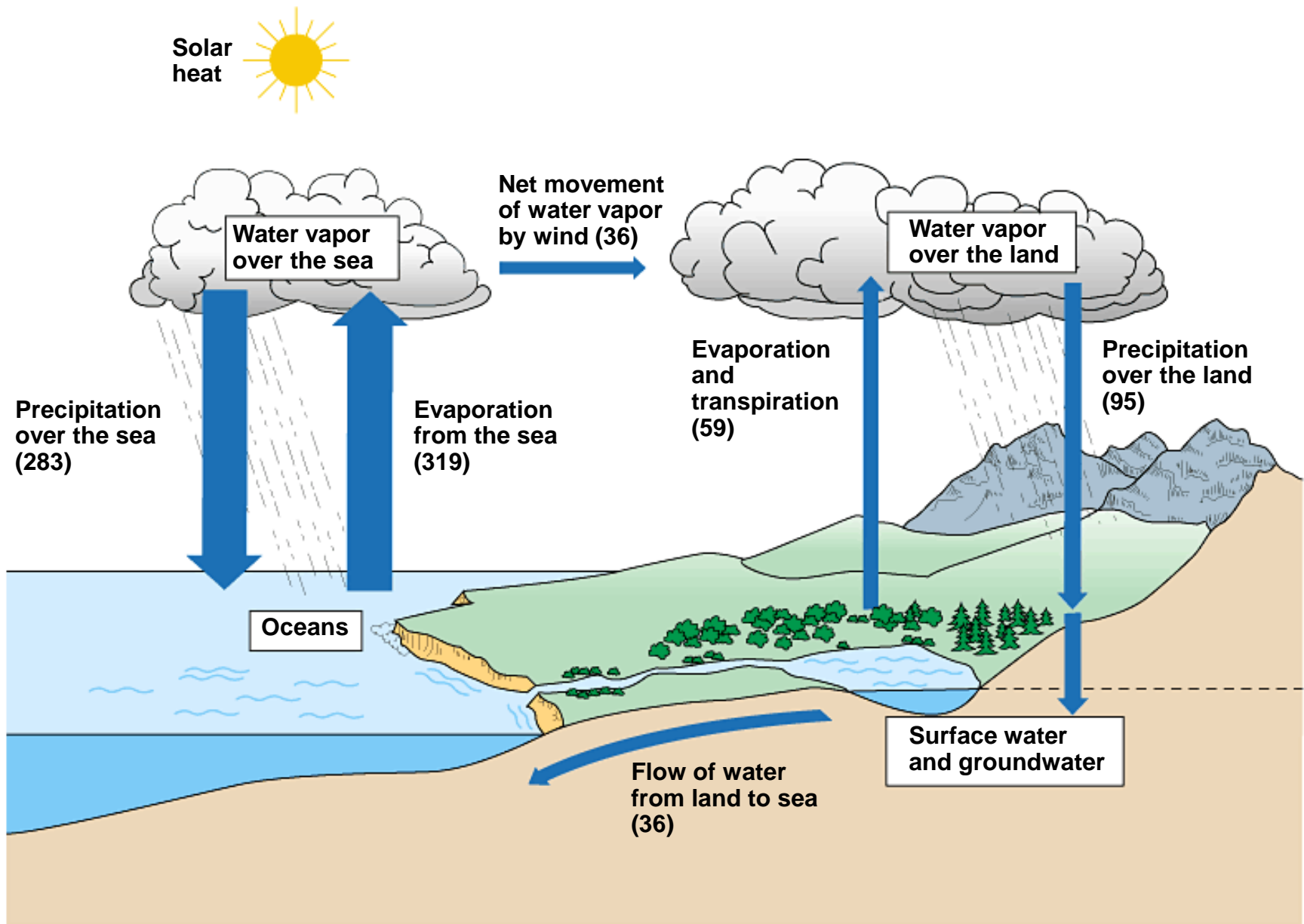
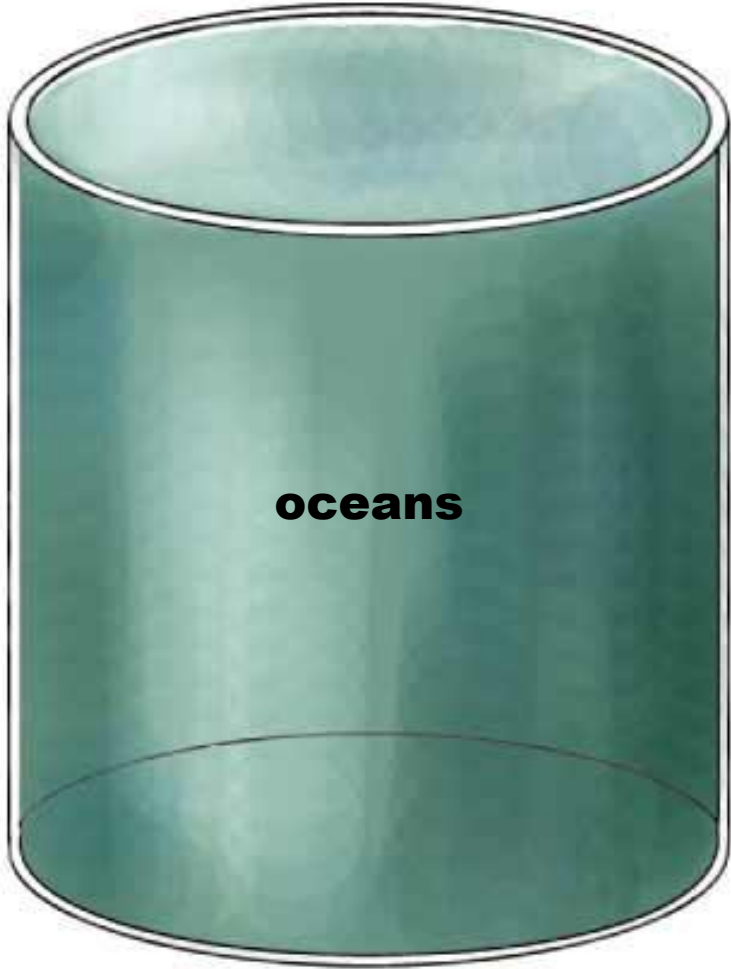


Figure 36.14

salt water = 97.5%



oceans

freshwater = 2.5%



**ice caps
and
glaciers
1.97%**

**ground-
water
0.5%**

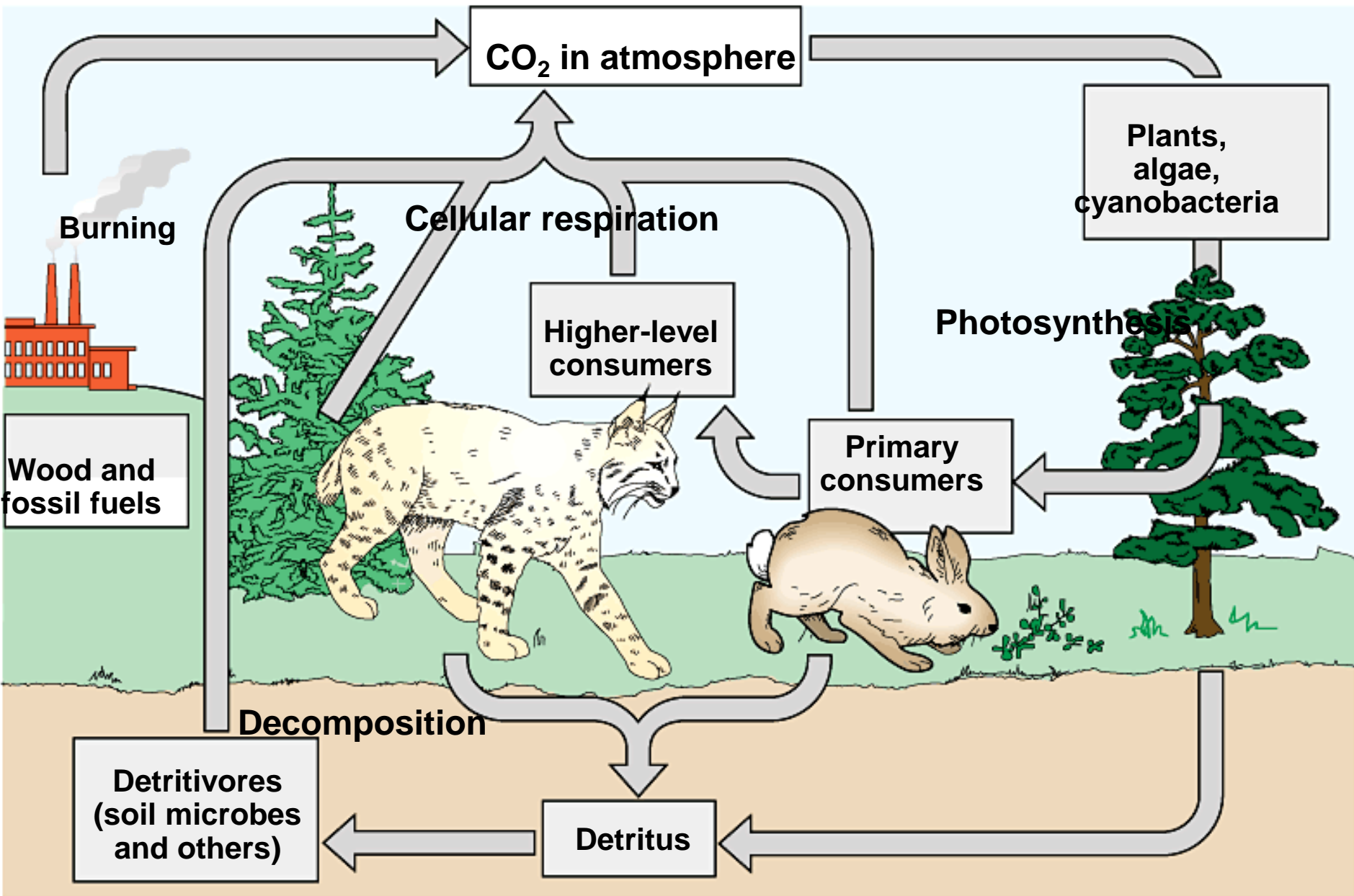
**lakes,
rivers,
and soil
0.03%**

**atmosphere
0.001%**



Carbon cycle

- Carbon is taken from the atmosphere by photosynthesis
 - used to make organic molecules
- returned to the atmosphere by cellular respiration,
decomposers



Figure

The nitrogen cycle relies heavily on bacteria

- Nitrogen is plentiful in the atmosphere as N_2
 - But plants and animals cannot use N_2
- Some bacteria in soil and legume root nodules convert N_2 to compounds that plants can use:
ammonium (NH_4^+) and nitrate (NO_3^-)

Legumes and certain other plants house nitrogen-fixing bacteria

- Legumes and certain other plants have nodules in their roots that contain nitrogen-fixing bacteria

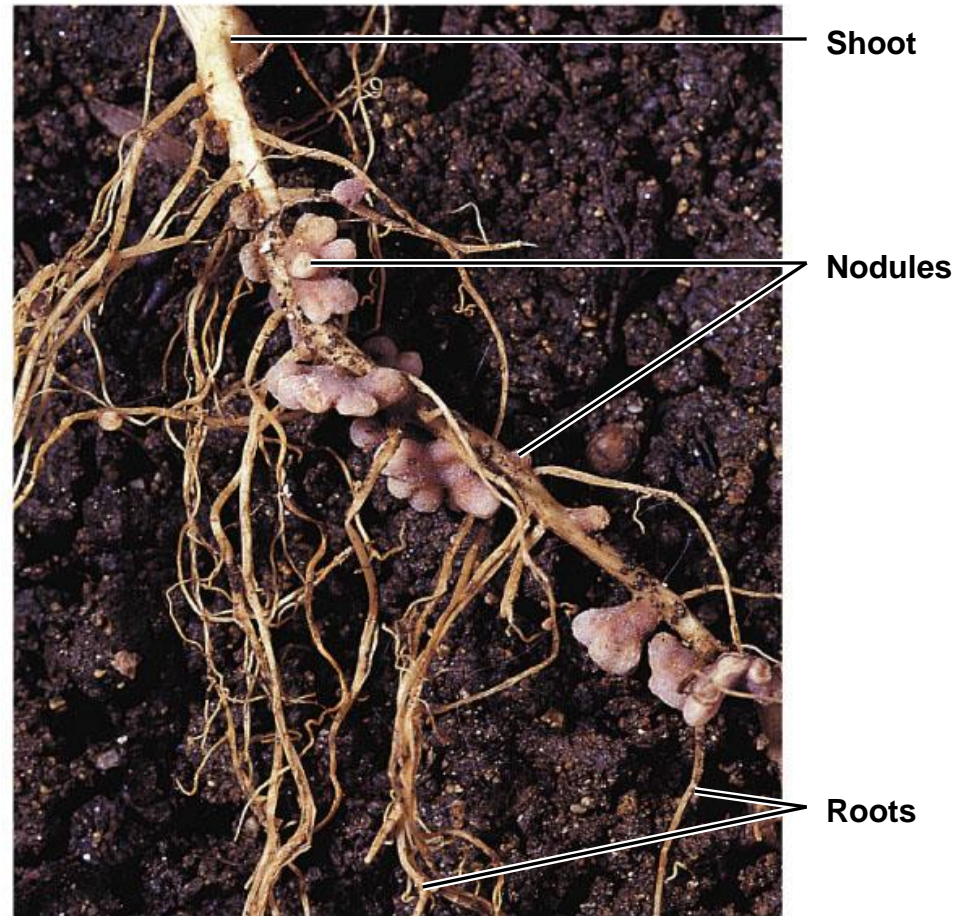
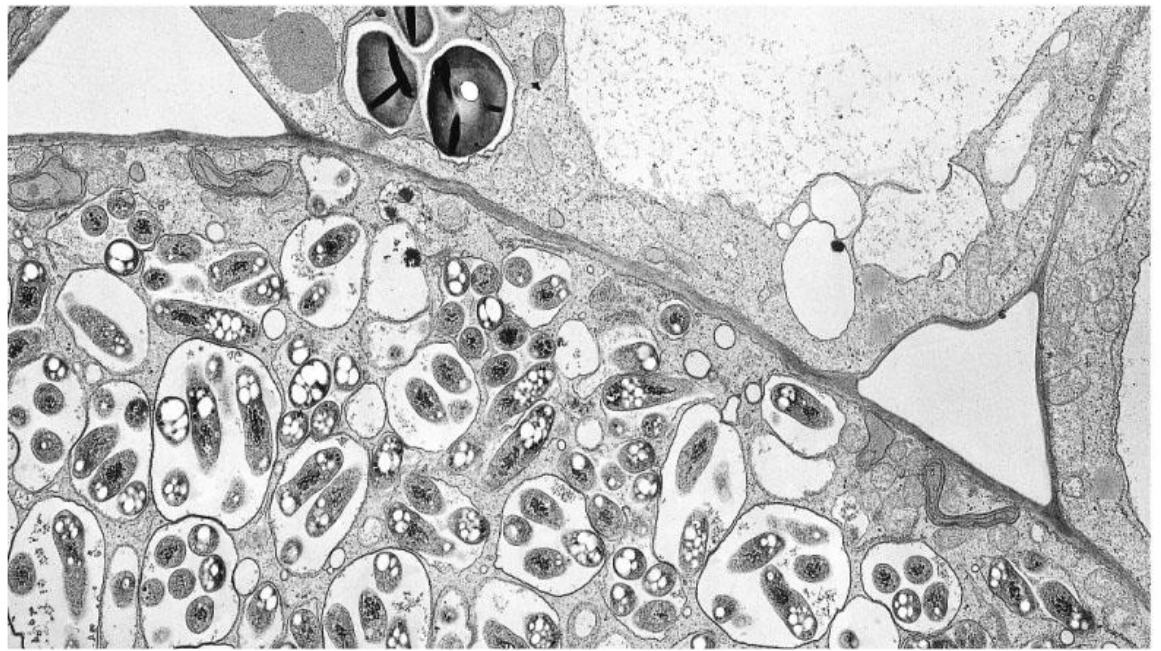


Figure 32.14A



ATMOSPHERE

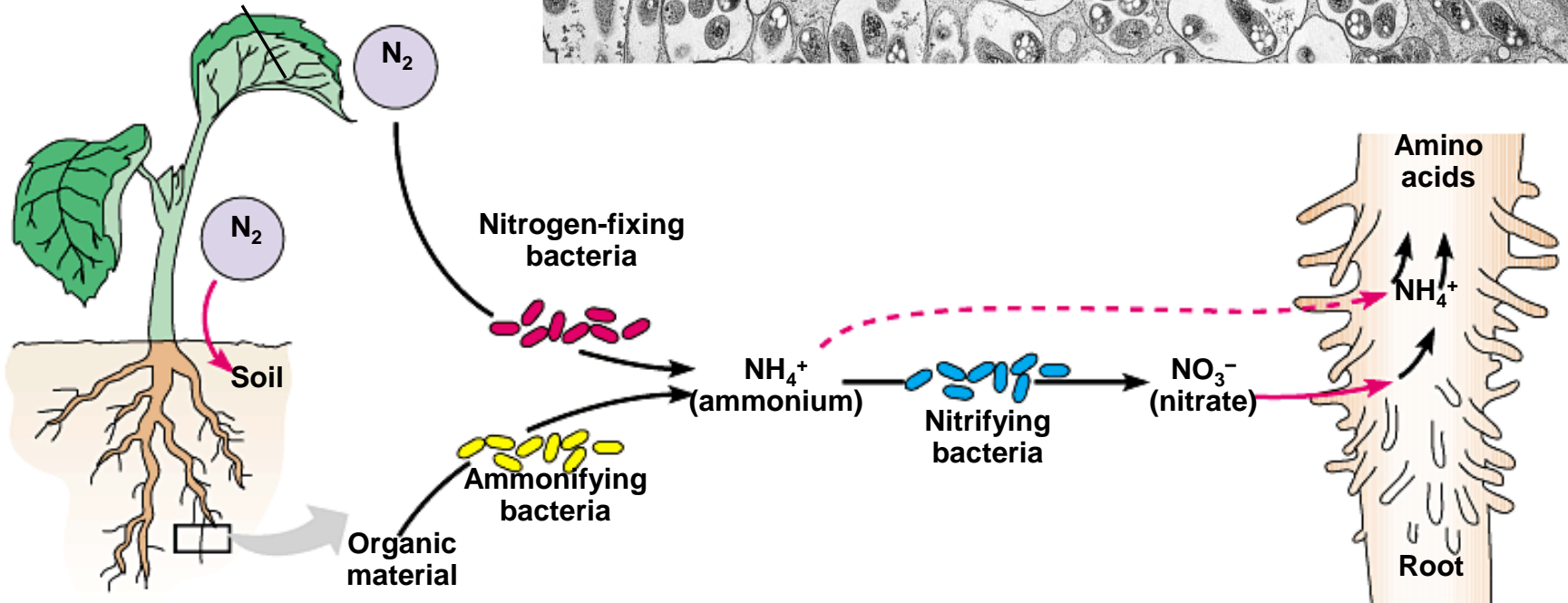
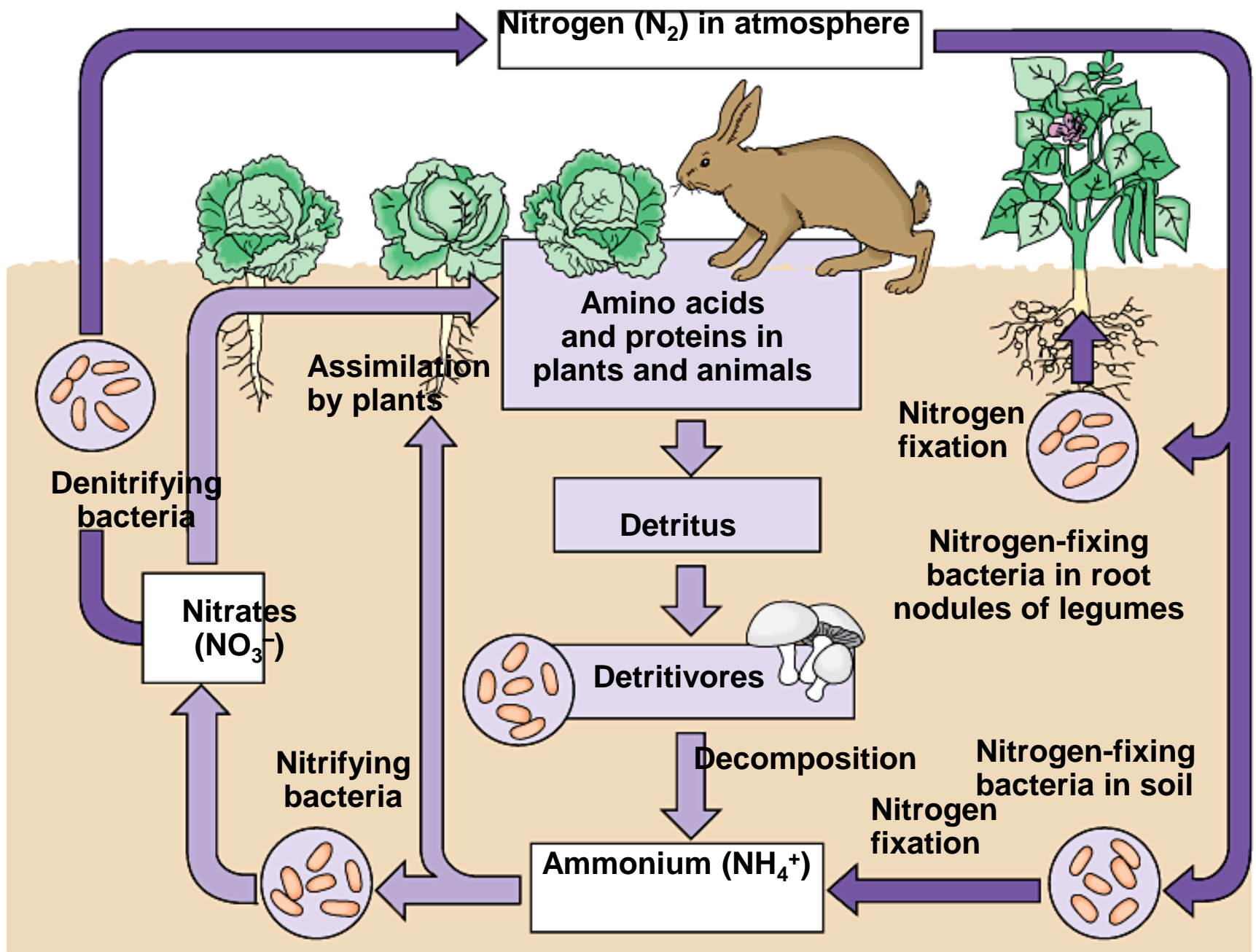
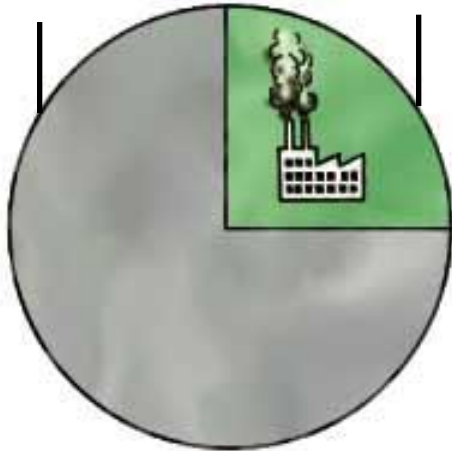


Figure 32.13



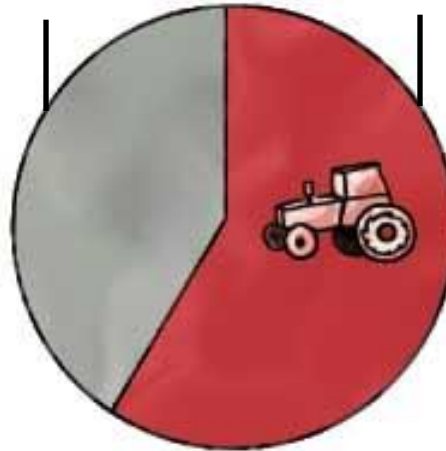
Human impact on chemical cycles

76% naturally occurring **24% human-caused**



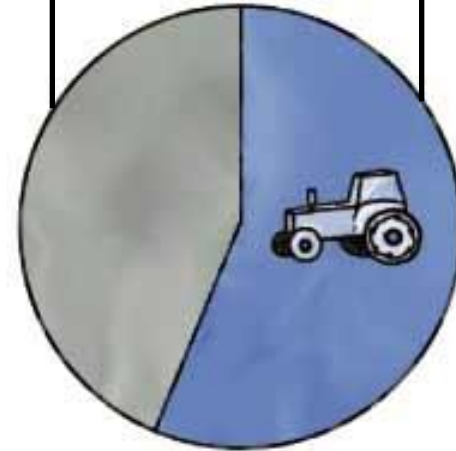
**Atmospheric
CO₂
concentration**

24% naturally occurring **58% human-caused**



**Terrestrial
nitrogen
fixation**

46% available **54% used**



**Accessible
surface
water**

- Environmental changes caused by humans can unbalance nutrient cycling over the long term
 - Example: acid rain
 - Sulfur dioxide, nitrogen oxides create strong acids when dissolved in rain water.
 - Low pH kills aquatic life, leaches nutrients from soil
 - Calcium deficiency affects everything in food chain: plants, insects, birds. Weak egg shells.

eutrophication • Algal bloom can cause a lake to lose its species diversity



- Human-caused eutrophication wiped out fisheries in Lake Erie in the 1950s and 1960s
 - classic experiments on eutrophication led to the ban on phosphates in detergents



Figure 36.19B

What are the limits to human alteration of chemical cycles and habitats?

- What should the limits be?
- How do we set priorities for what we value in the natural world?
Aesthetic, economic, conservation, humans