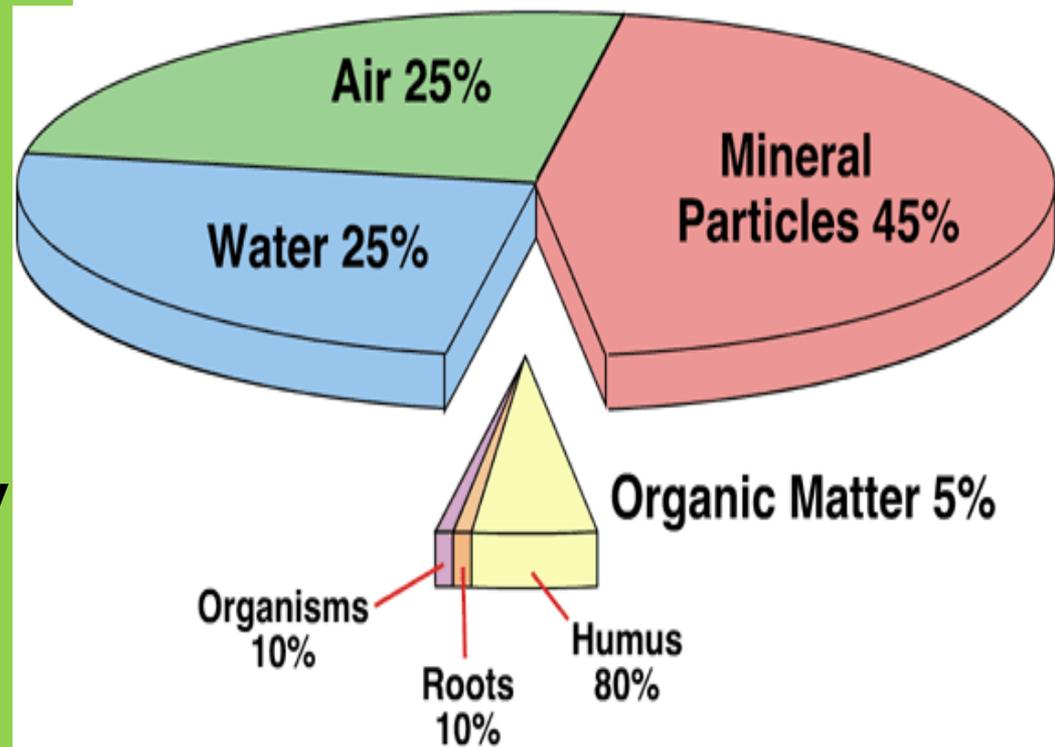


Getting the Dirt on Soil

Soil Composition

- Soil is a thin layer over most land that is a complex mix of rock, nutrients, decaying matter, water, air and billions of organisms...many microscopic decomposers



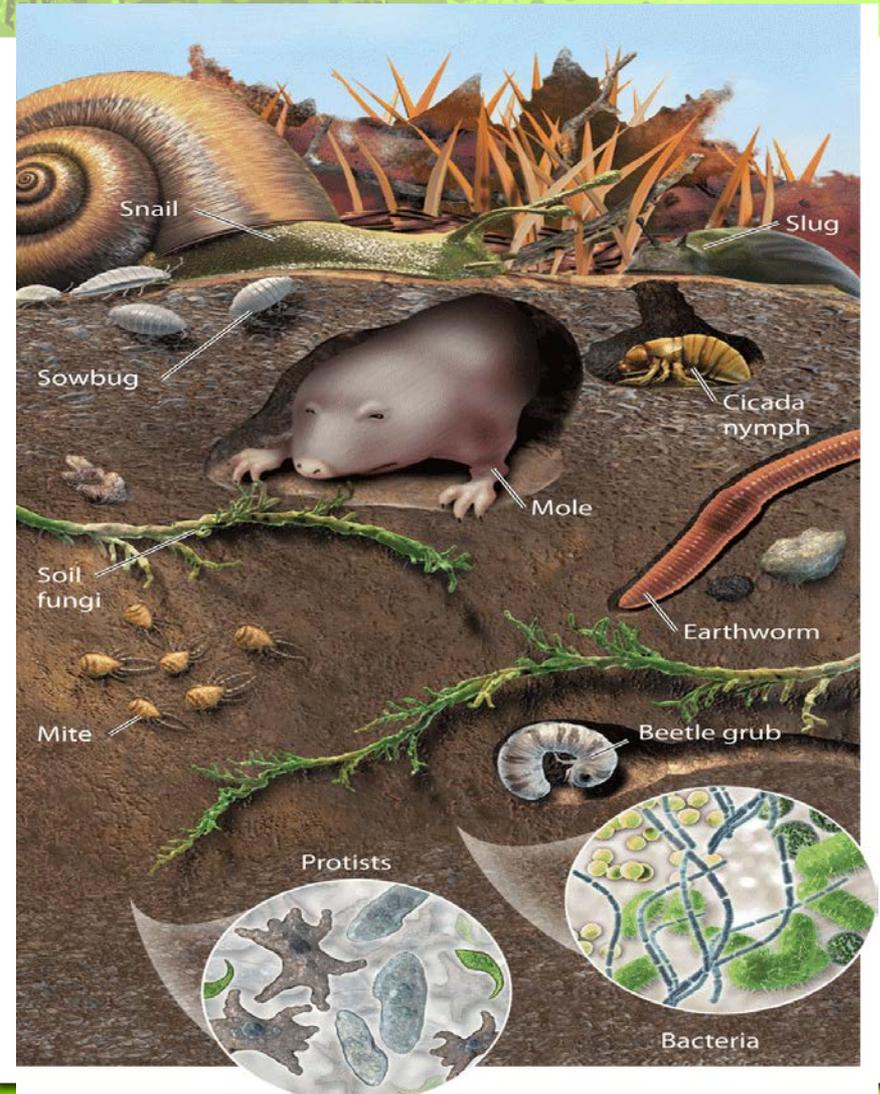
What is soil made of?

- Soil is made up of minerals, organic matter, air, and water.
- Soil composition is influenced by climate, organisms, landforms, parent material, and time

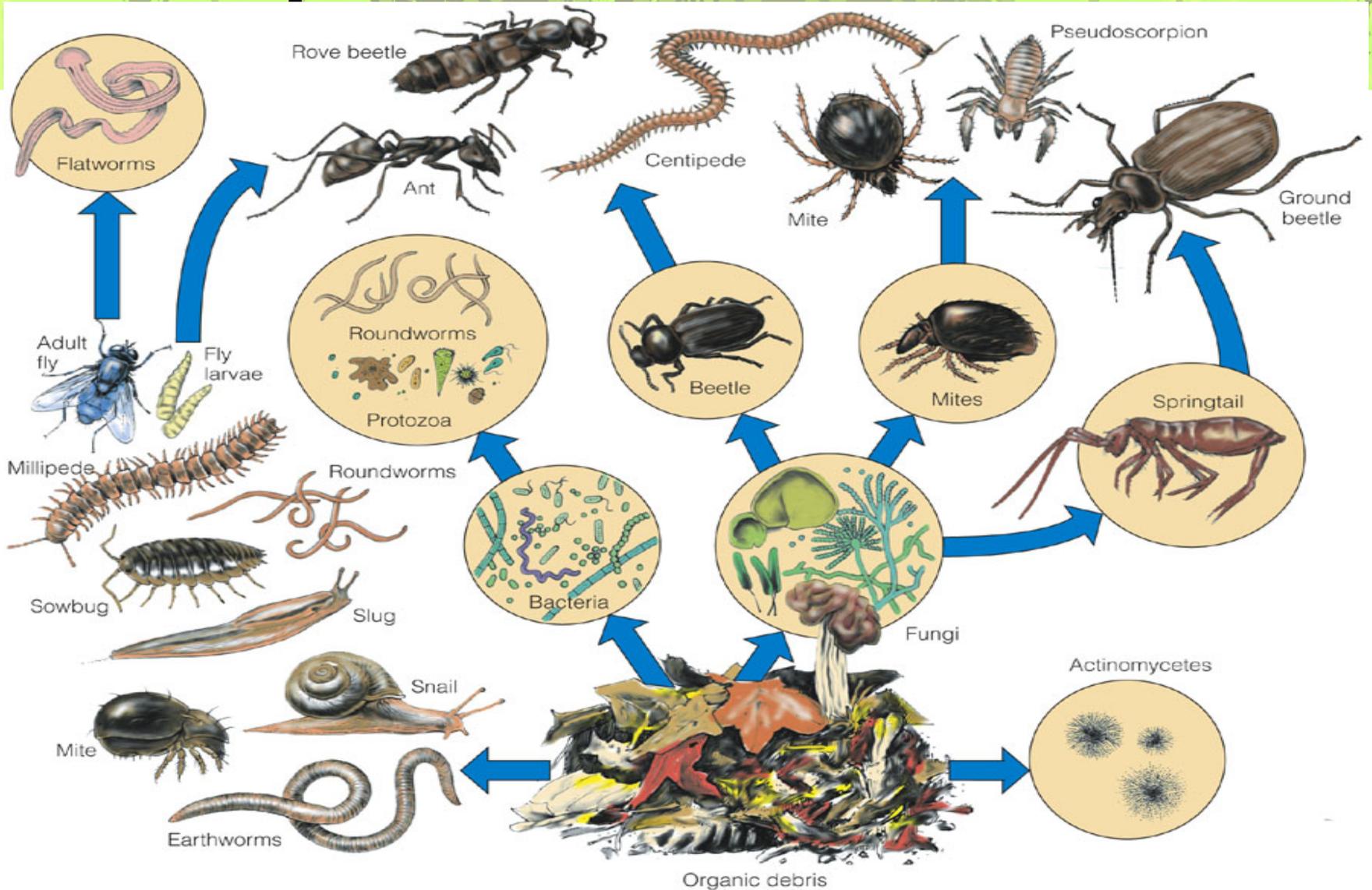


Why is soil important?

- Renewable resource...SLOW
- Depends upon climate (1cm in 15yrs.)
- Basis of life
- Filters water
- Water storage
- Habitat

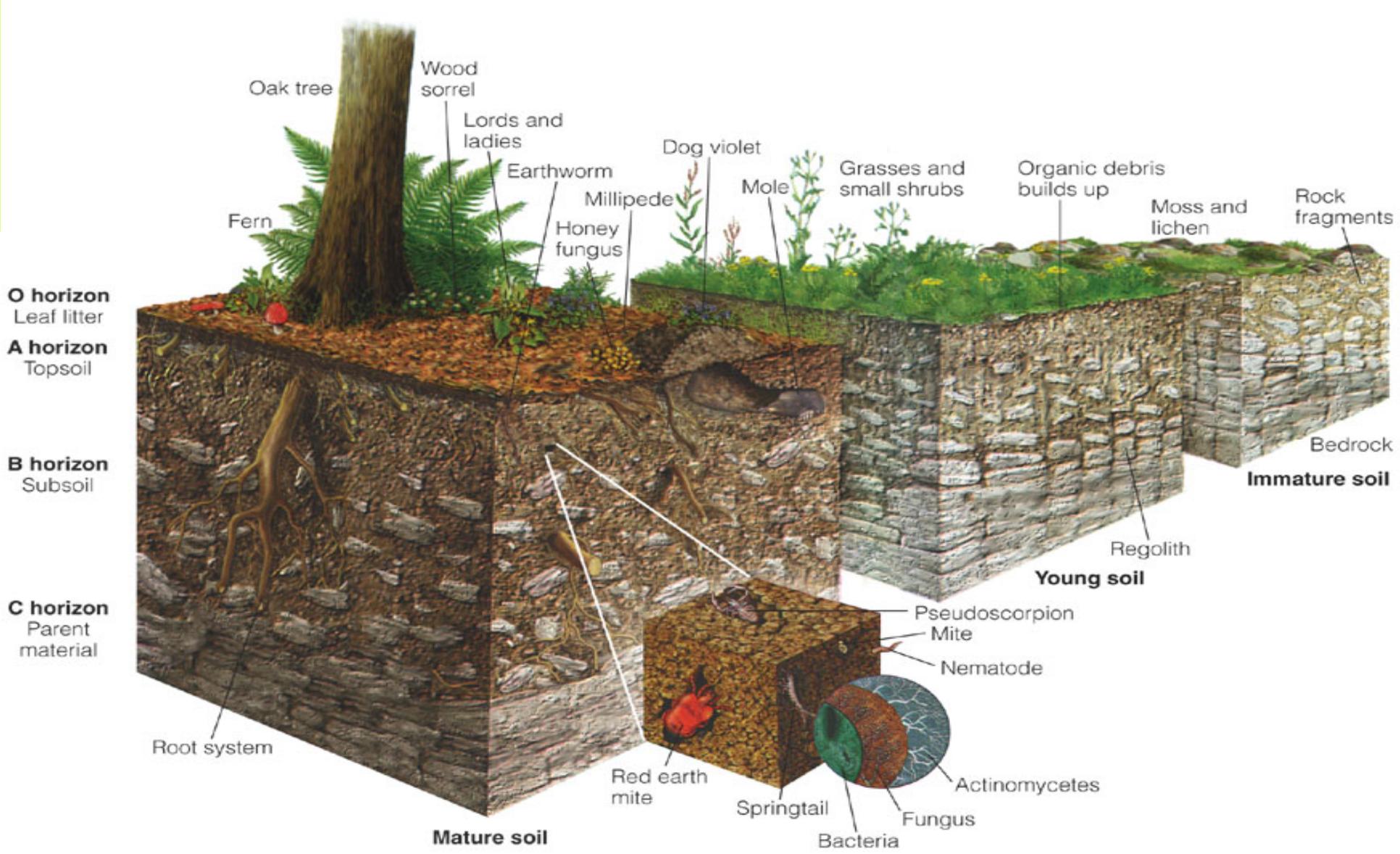


Simplified Soil Food Web



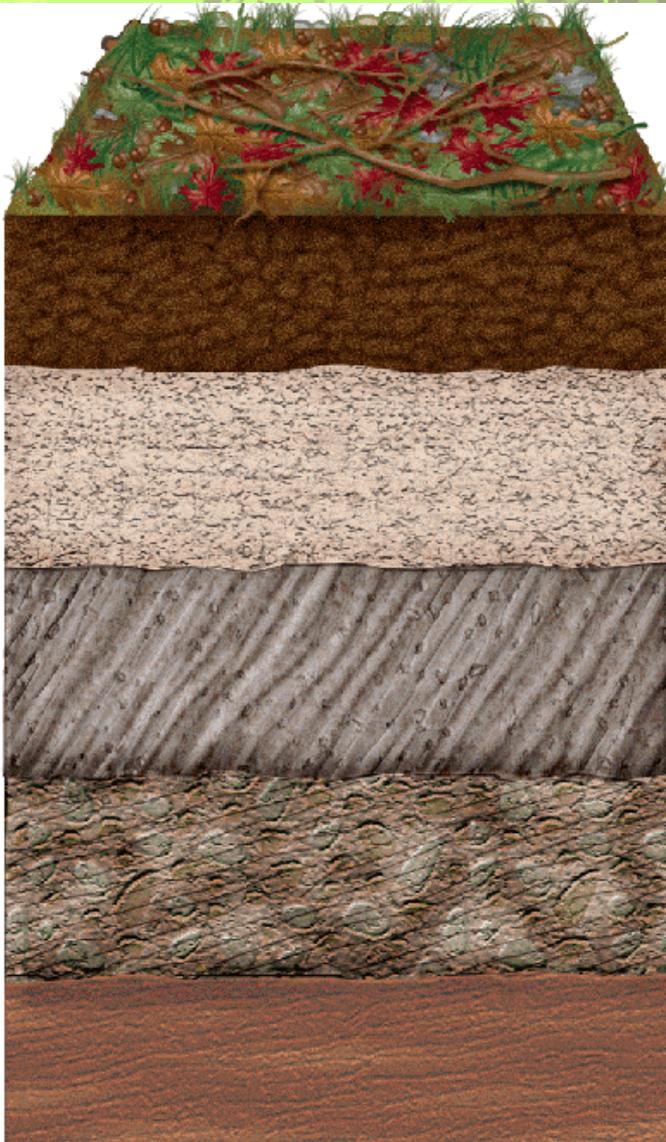
Soil Formation

- **Weathering**: Physical and chemical breaking of rocks and minerals into smaller pieces
- **Erosion and deposition**: Pick-up, transport, and drop-off of material from one place to another
- **Decomposition**: Breakdown of waste, organisms, and organic material into simple molecules



PARENT MATERIAL

Soil Horizons



O Horizon
Litter layer

A Horizon
Topsoil

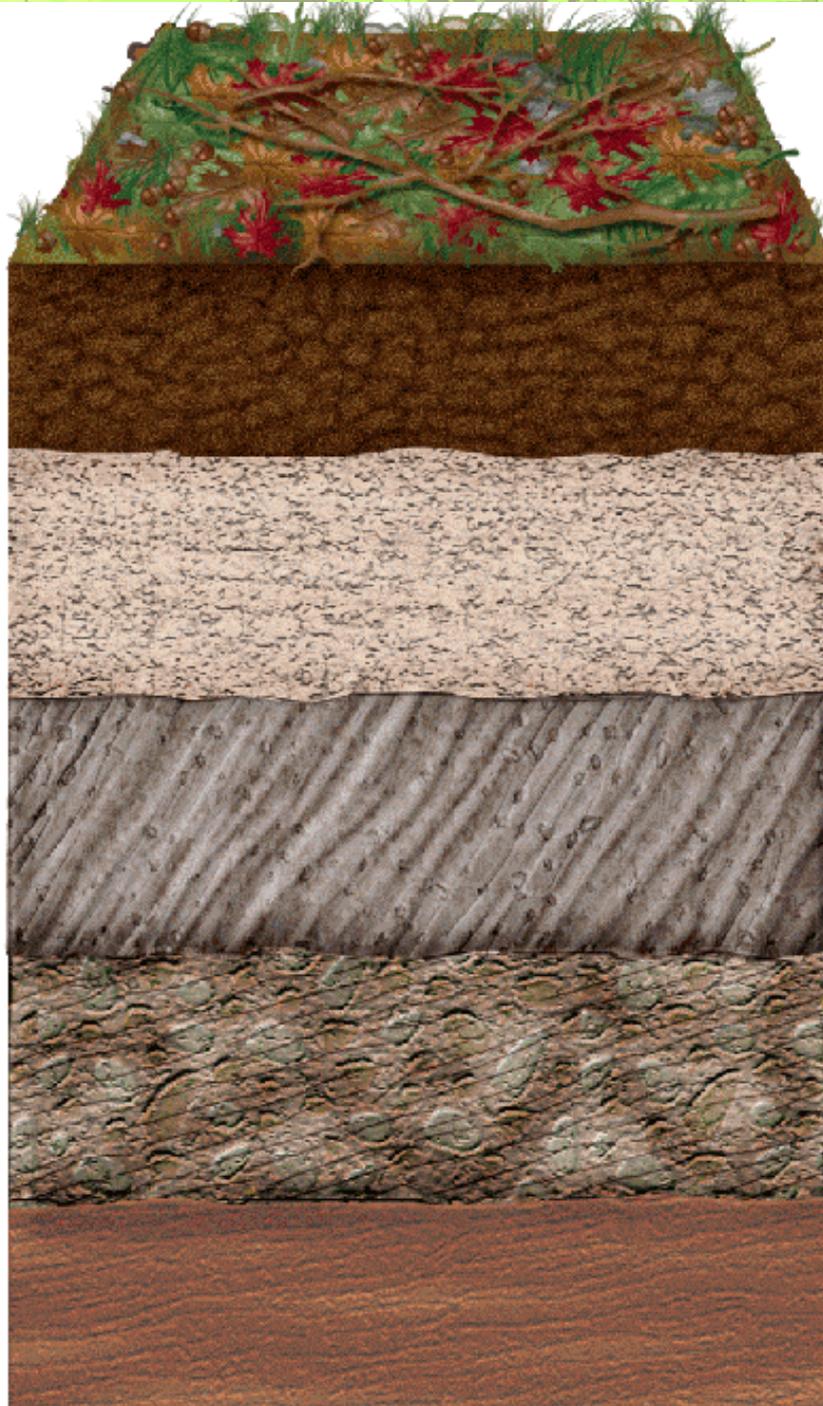
E Horizon
Leaching Layer

B Horizon
Subsoil

C Horizon
Weathered
parent material

R Horizon
Parent material

- Soil horizons are distinct layers of soil.
- A cross-section of soil horizons is a soil profile.
- “A” is most critical



O Horizon
Litter layer

A Horizon
Topsoil

E Horizon
Leaching Layer

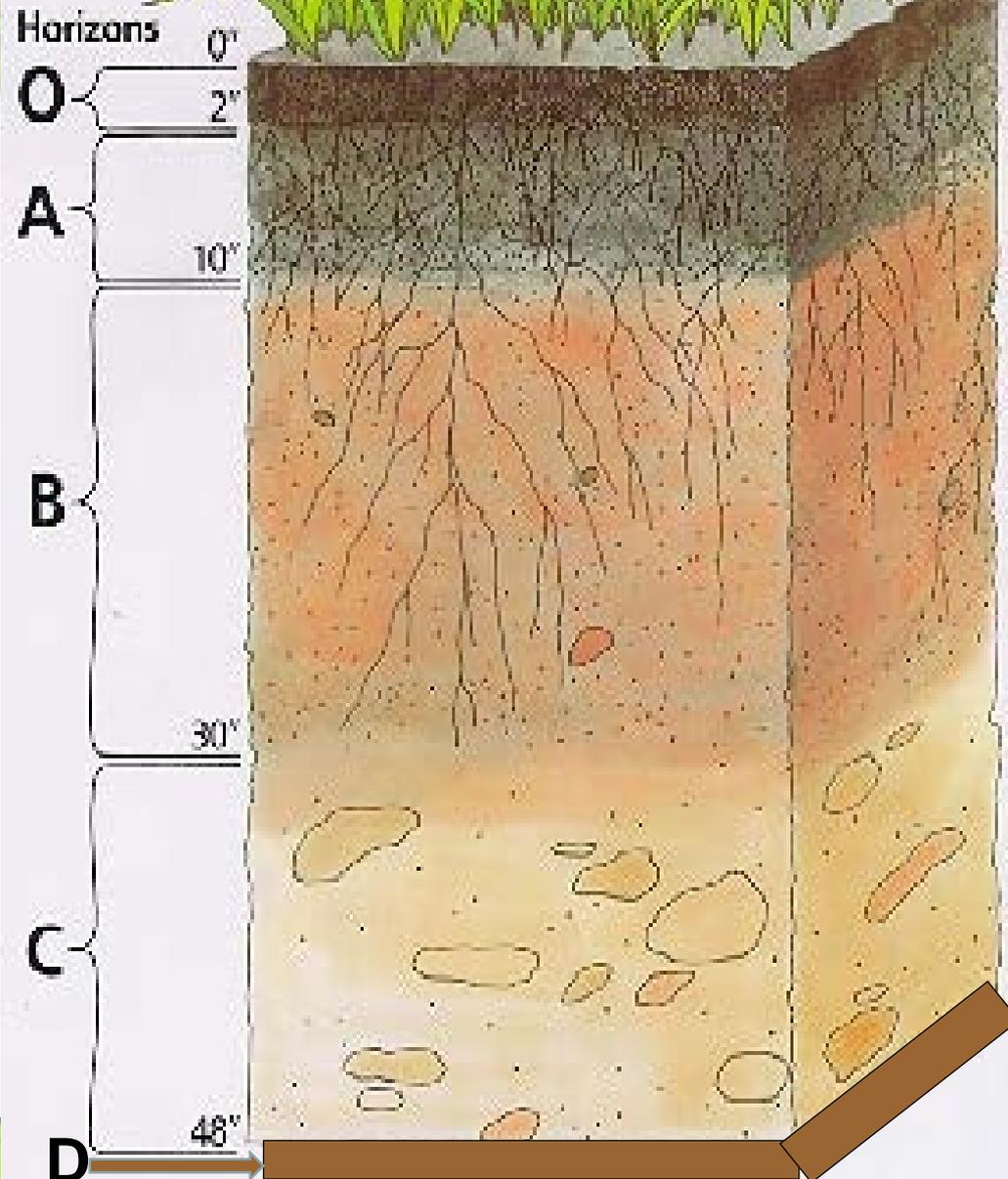
B Horizon
Subsoil

C Horizon
Weathered
parent material

R Horizon
Parent material

In general, organic matter is concentrated in the O and A horizons, making them the most critical for agriculture.

A Soil Profile



O Horizon: Organic material

Living things carry on life activities. Millions of dead plant and animal organisms are slowly decomposing. Takes from 100 to 600 years to form.

A Horizon: Topsoil containing humus

Organic matter, roots, worms, insects, and other living organisms, small rock and mineral fragments. Dark in color.

B Horizon: Subsoil

Some roots and other living organisms, materials leached by water from the A horizon, clay, rock fragments, minerals. Lighter in color than topsoil.

C Horizon: Weathered Parent Rock

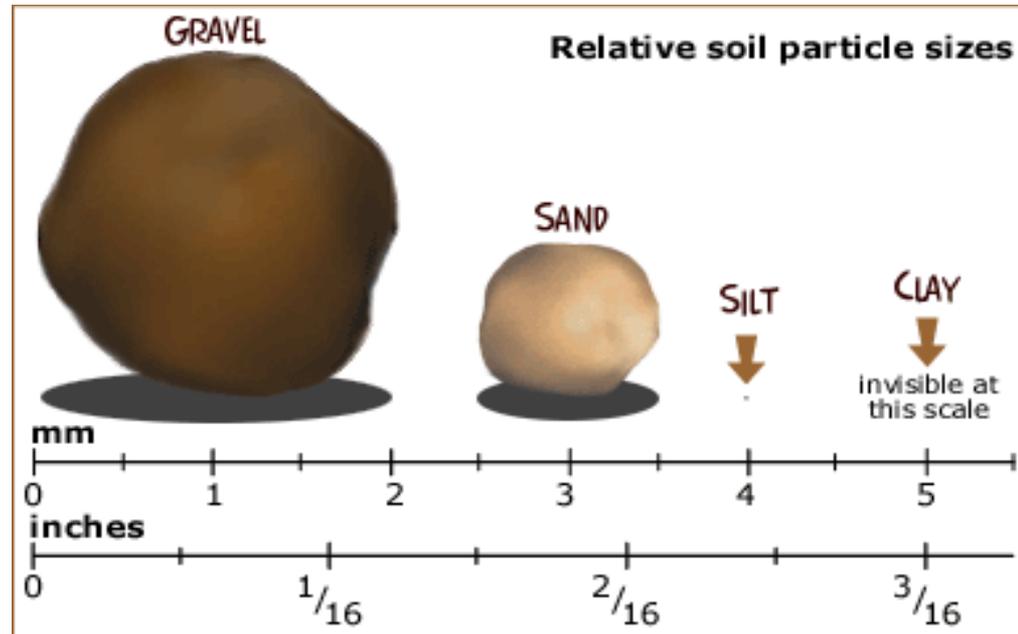
Materials leached by water from the B horizon, partly weathered rock fragments. Orangish, yellowish color.

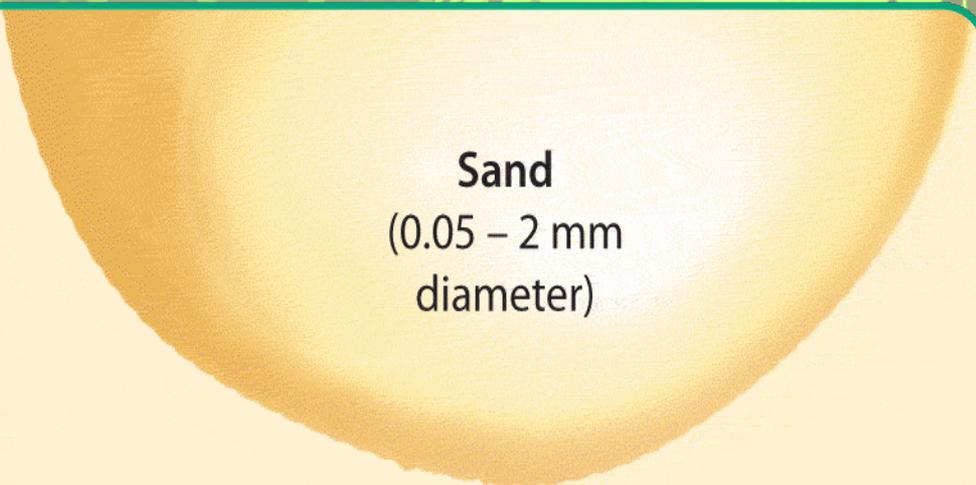
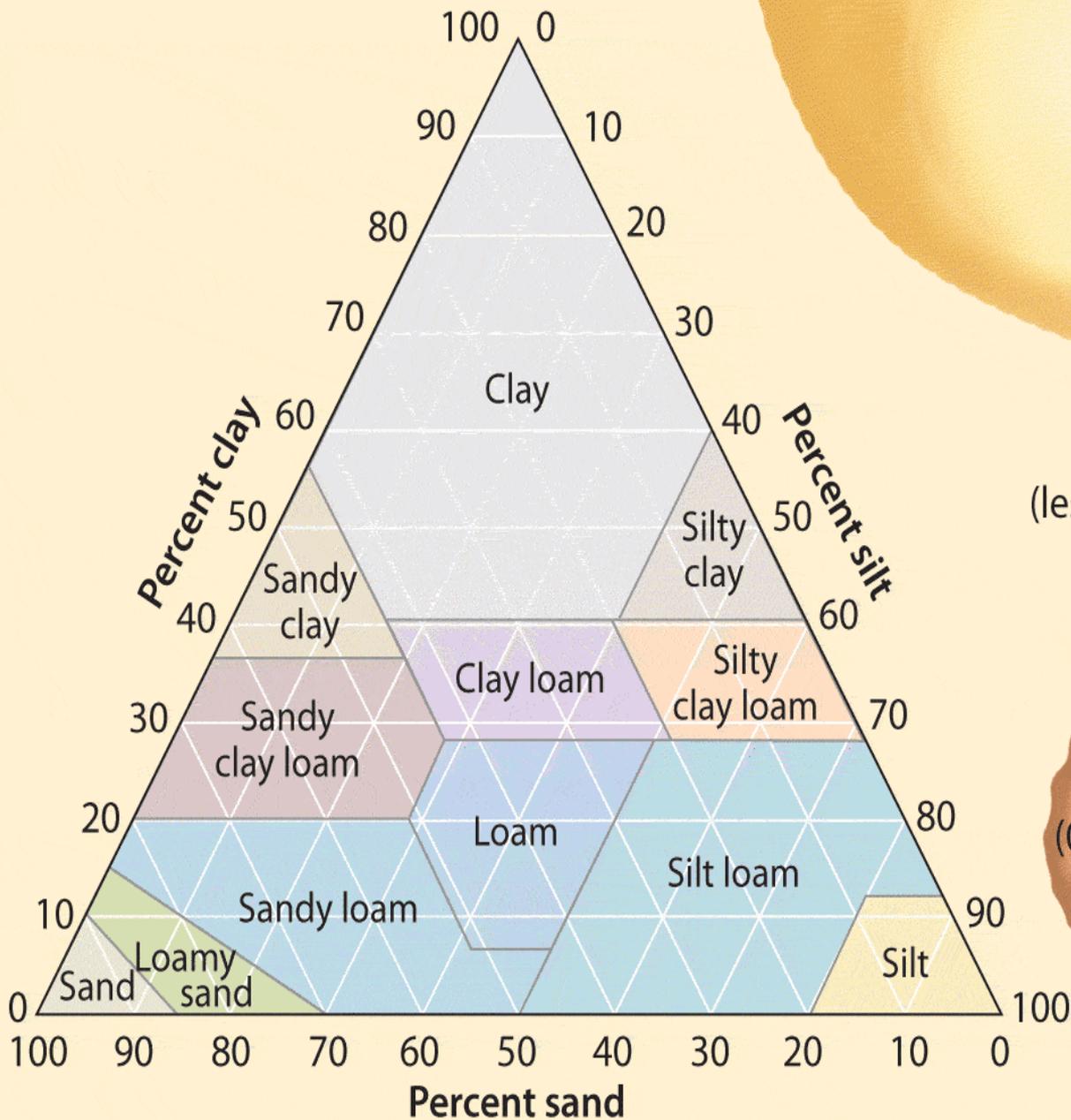
D Bedrock: Unweathered Parent Rock

Also called Parent Rock.

Soil Characteristics

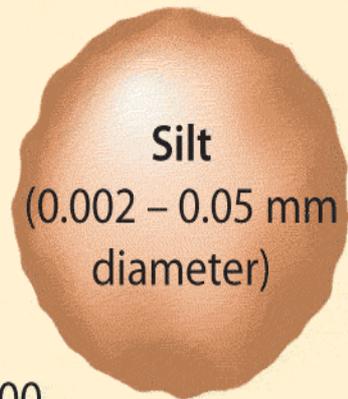
- Soil groups are further classified according to properties such as color, structure, pH, and texture.
- Soil texture is based on particle size.





Sand
(0.05 – 2 mm diameter)

Clay
(less than 0.002 mm diameter)



Silt
(0.002 – 0.05 mm diameter)

Topsoil Color



- Dark, loamy, neutral pH are some of best soils for farming
- Dark color often means lots of decayed material (nutrients)

Sand	Silt	Clay
Forms free draining soils	Forms soil which can be hard to drain	Forms soil which readily becomes waterlogged
Water runs through it quickly	Hold on to moderate amounts of water	Becomes heavy when wet
Largest mineral particle (2mm-.06mm). Feels gritty to touch.	Medium mineral particle size (.06-.002mm). Feels soapy or silky.	Smallest particle size (less than .002 mm). Feels rough when dry and sticky when wet
Particles do not stick together and cannot be made into a ball.	Particles do not easily hold together-a ball of them breaks easily.	Particle stick together and are easy to make into a ball
Forms soil which cannot hold onto nutrients	Forms soil which can only hold limited nutrients	Forms soil which can hold onto nutrients
Can be used to make glass	Makes fertile soil	Makes very fertile soil and can be used to make bricks

Causes of Soil Erosion

- Wind
- Water
- Humans



Soil Erosion

- Often occurs faster than soil is formed, depleting fertile topsoil
- Crops, trees, and other plant communities protect soil from erosion.

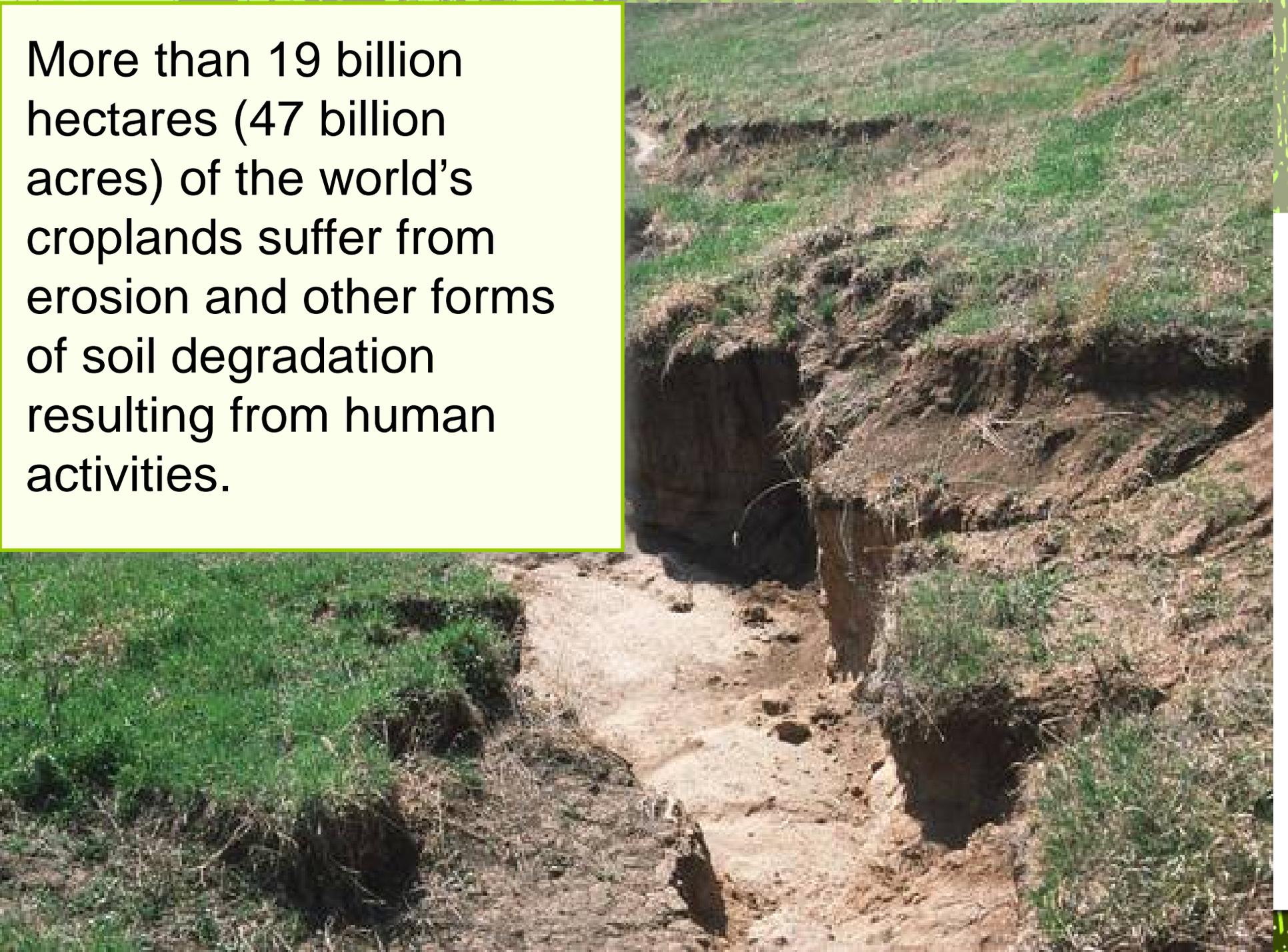


Erosion Due to Human Actions

- Excavation and mining
- Over-grazing of grass by ranching animals
- Rapid land development which leads to desertification



More than 19 billion hectares (47 billion acres) of the world's croplands suffer from erosion and other forms of soil degradation resulting from human activities.



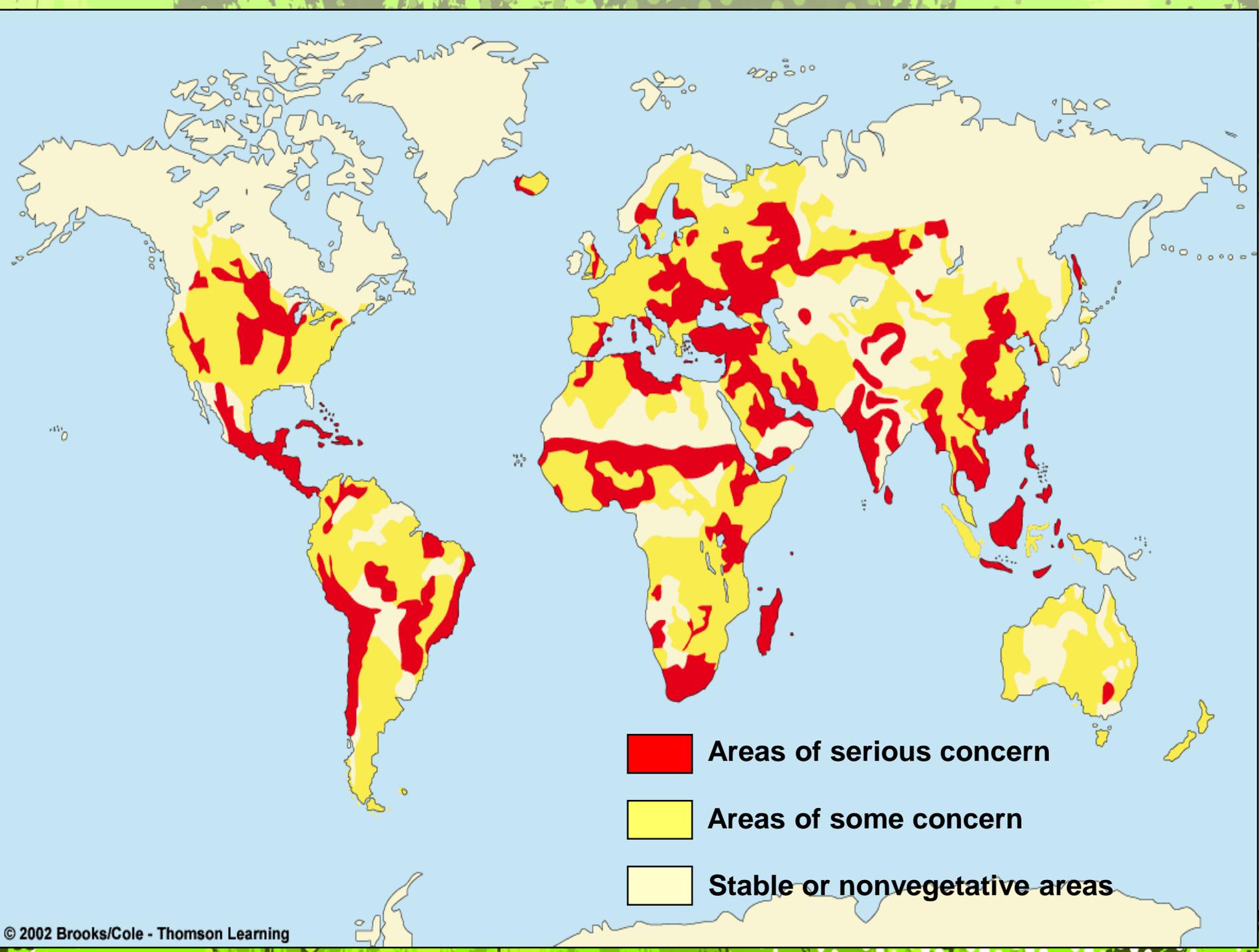
Impacts of Soil Erosion

- Loss of soil fertility
- Sediment runoff causes problems in surface water (pollution, clog ditches, boat channels, reservoirs)
- #1 source of U.S. water pollution
- Renewable only on LONG timeframes (200-1,000yrs. for 1 inch)



Soil is eroding 16 times faster than it is created in the United States.





Farming Practices That Reduce Erosion



Crop Rotation

Crop Rotation is an alternative to planting a field in the same crop year after year. Instead, the main crop is rotated, ideally with cereal crops like winter wheat or forages such as clover and alfalfa.

3 Year Crop Rotation

Root
& Bulb



Fruit
& Seed



Leaf
& Stem



Cover Crops

Cover crops are crops planted to reduce the impact of wind and water on bare soil. They absorb the impact of rain, reduce the speed of runoff, hold the soil in place, and encourage greater infiltration; and hence less runoff.



Terrace Farming

A terrace is a constructed earthen ridge with a water channel along the upper side. They are designed to intercept runoff on a slope, and reduce its erosive action on the soil down the slope.



Contour Farming

Contour farming involves tilling and planting along the contour, rather than up and down the slope. The rows of plants act as dams which slow down the flow of water moving down the slope. Unless some type of contour farming is used, particularly on long slopes, serious field erosion can result.



No-till Farming

A true no-till system avoids disturbing the soil with tools like chisel plows, field cultivators, disks, and plows. This method leaves plant stocks and crop remnants in the soil while planting new seeds on top.

