

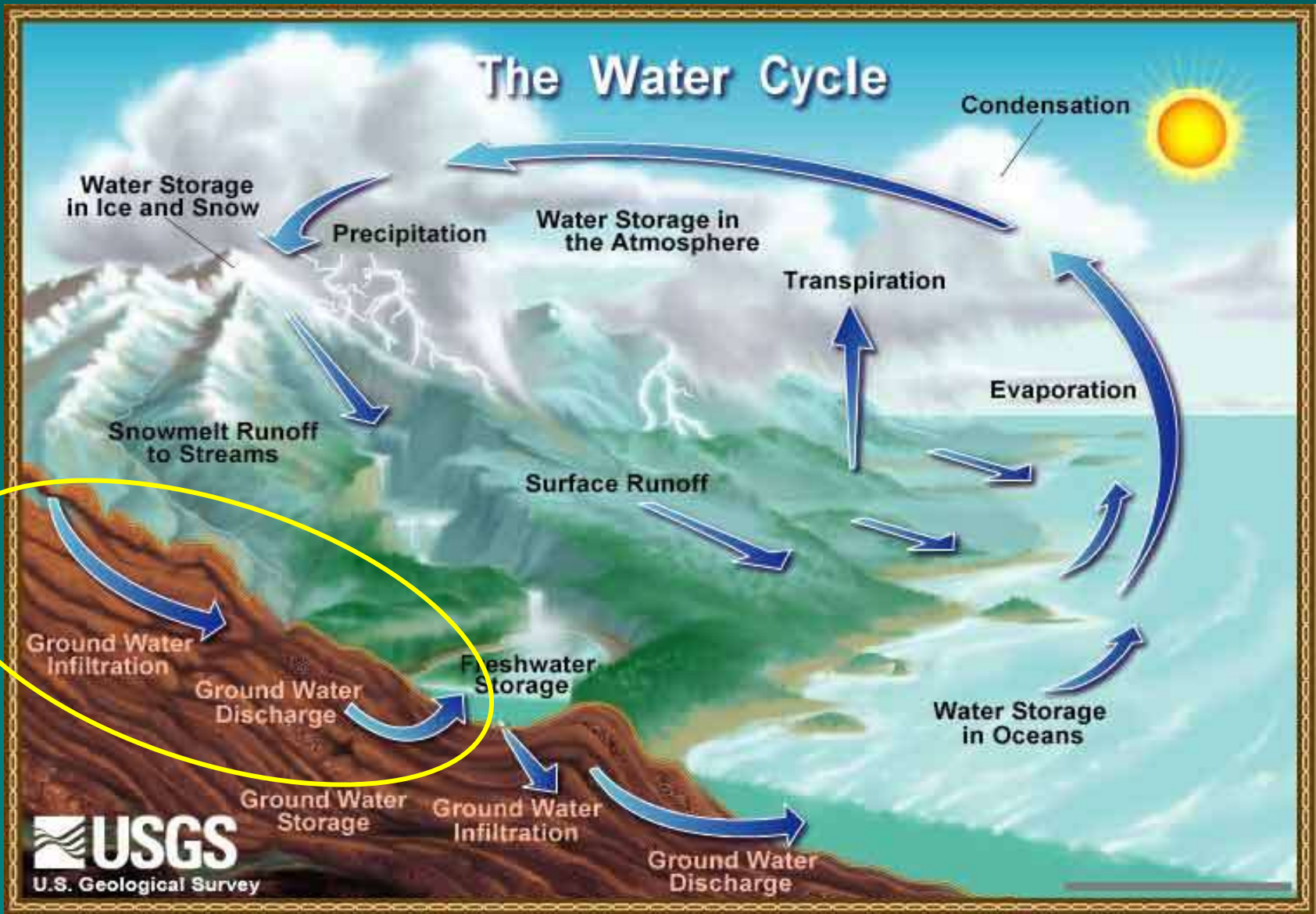
Why Soil Health Matters to...Recharge Quantity and Quality

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What is recharge?



How do you make a stream flow?

Runoff

Direct Precipitation

Tributaries

Baseflow



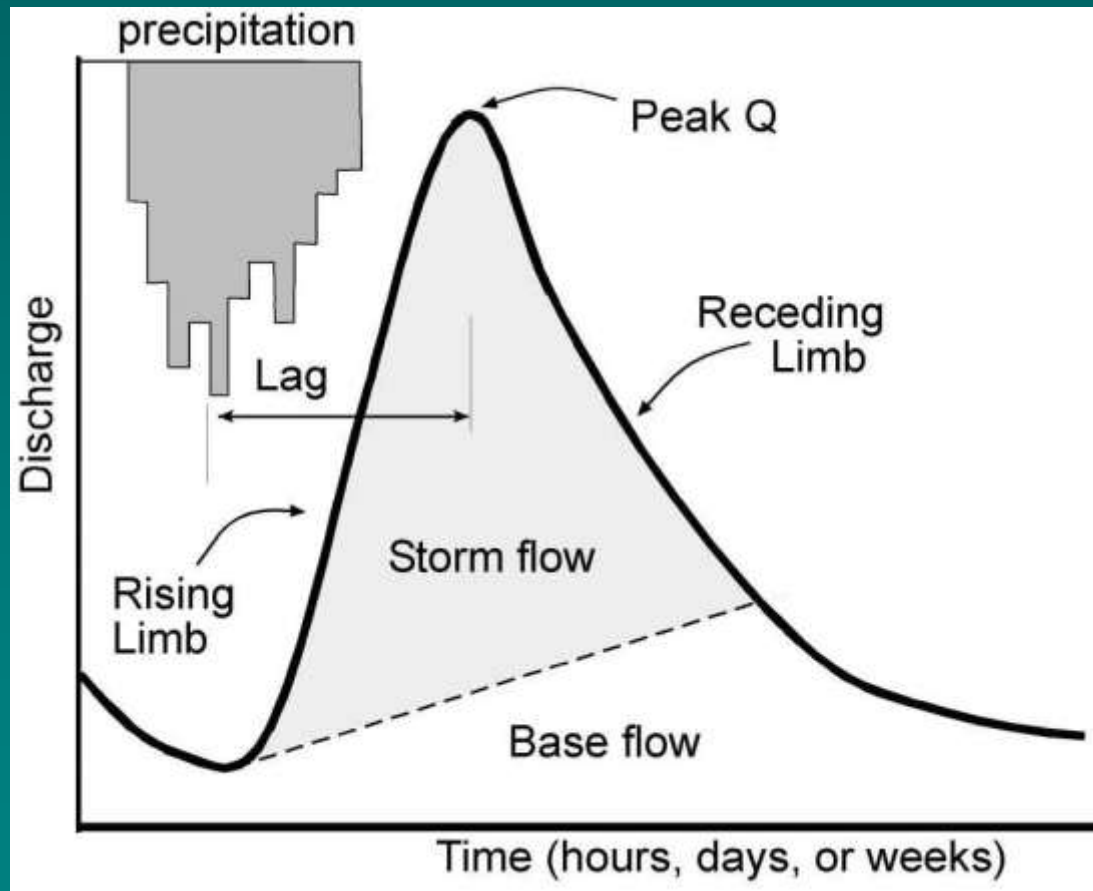
*Ken Lockwood Gorge , South Branch Raritan River
photo by Peter Murphy (www.njmonthy.com)*

What is Baseflow?

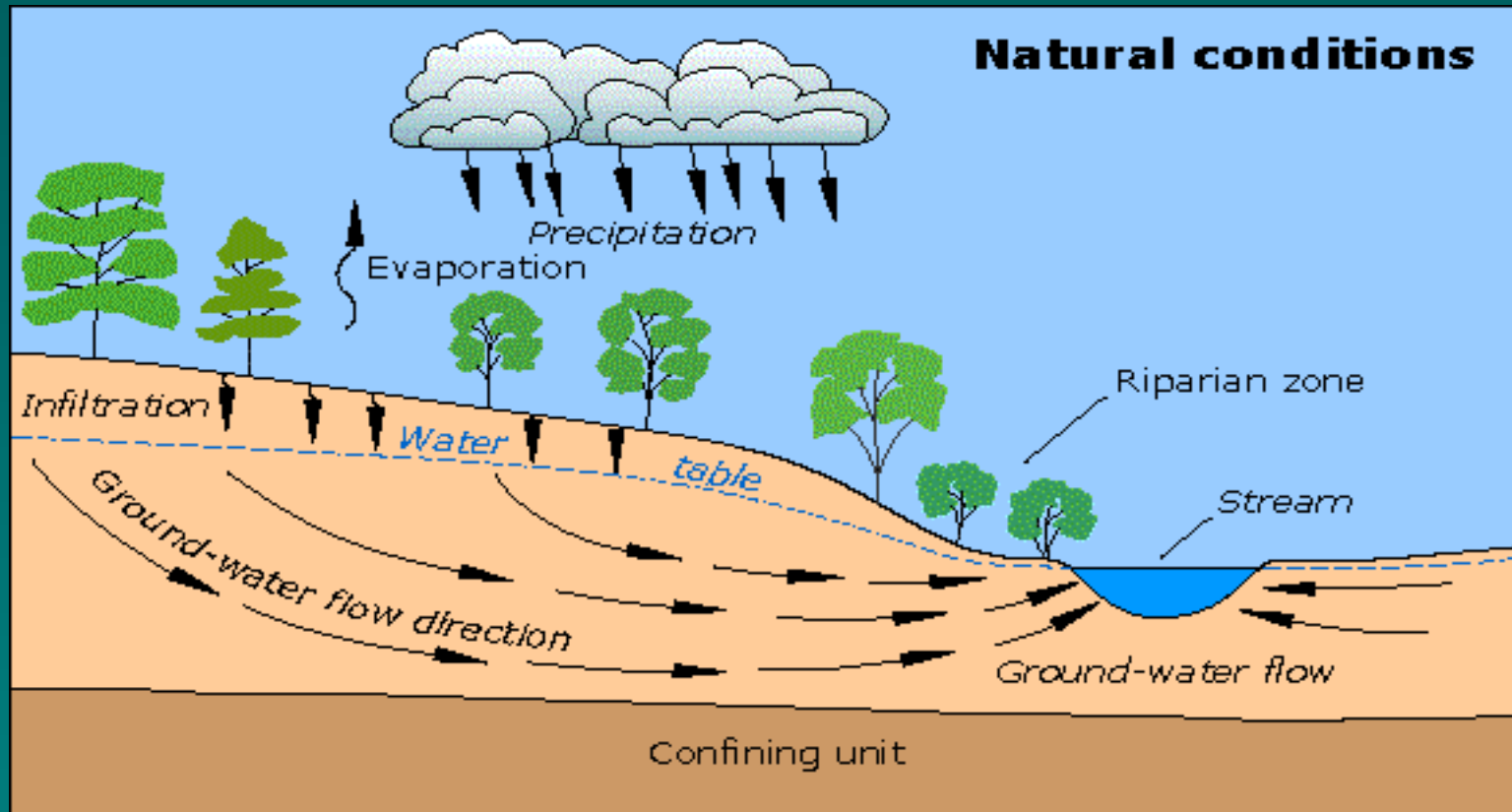
Baseflow is the longer-term discharge into a stream from natural storages, notably sustaining flow between rainfall events.

Natural Sources

- Groundwater
- Bank Storage
- Wetlands
- Lakes
- Snow

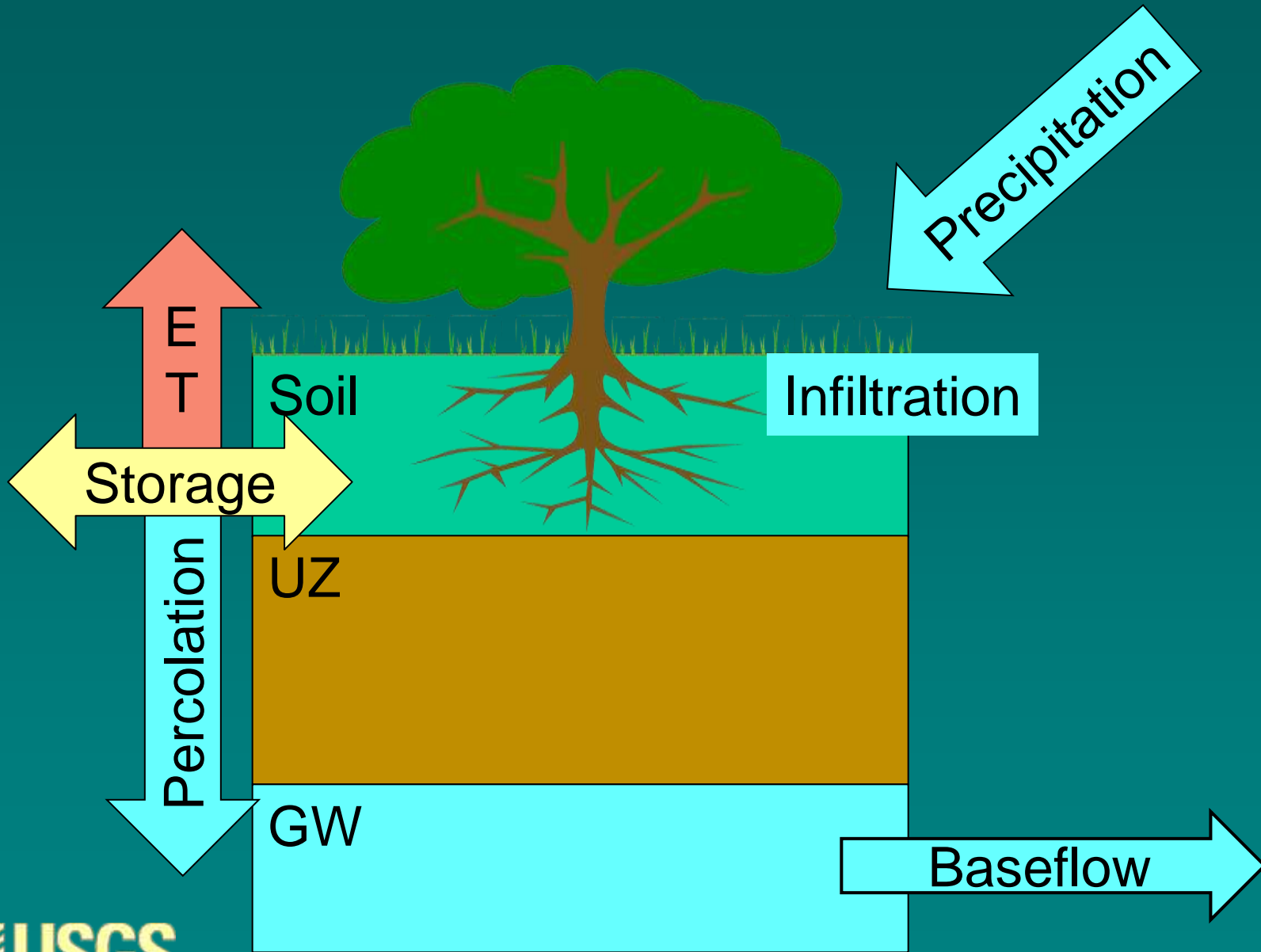


How does groundwater get into streams?



<http://ga.water.usgs.gov/edu/earthgwdecline.html>

How does water get to the water table?



When soil health is poor...

- Poor/no soil structure
- Reduced porosity
- Decreased infiltration and percolation rates

...recharge quantity declines!

- Declines in baseflow
 - Habitat loss
 - Water supply issues
- Declines in surficial aquifers

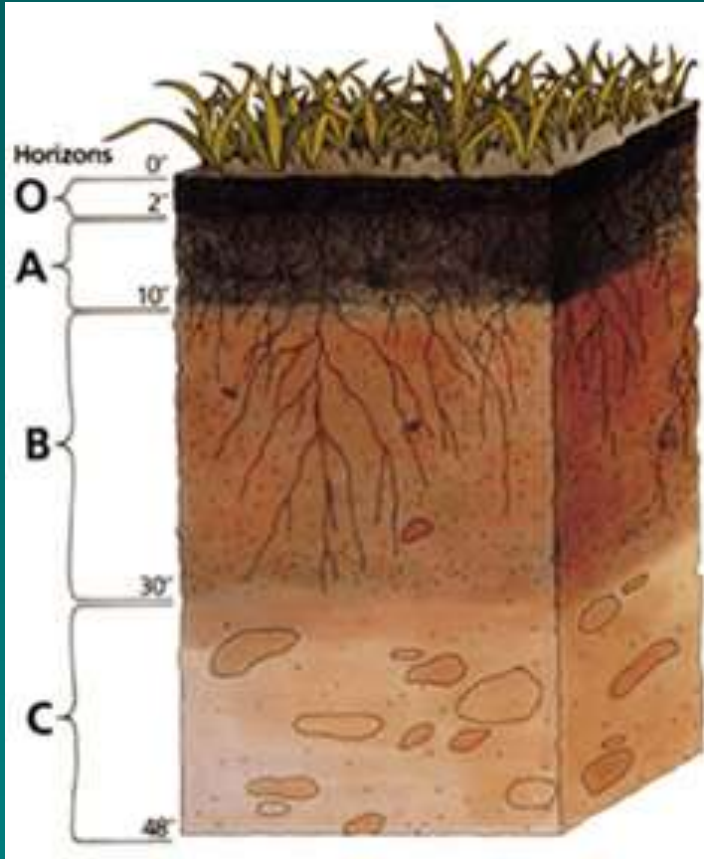


What's in that water we're recharging with?

- Source of water
 - Precipitation/snowmelt
 - Irrigation/chemigation
 - Treated wastewater
- Land use
 - Undeveloped
 - Agriculture
 - Residential/industrial



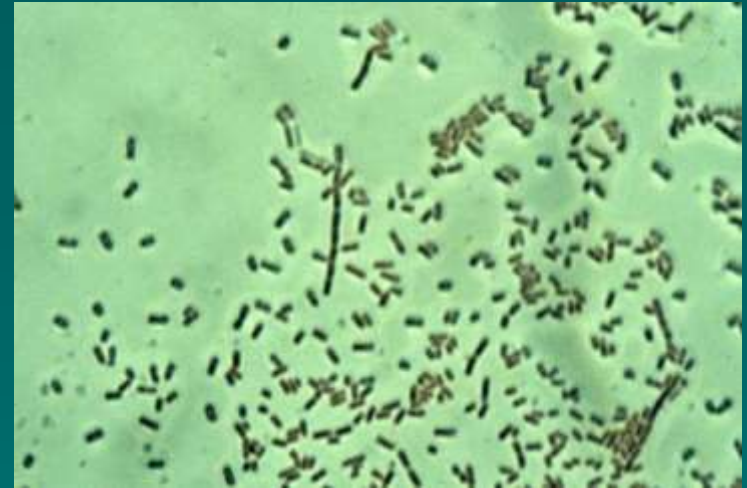
A healthy soil is a living filter!



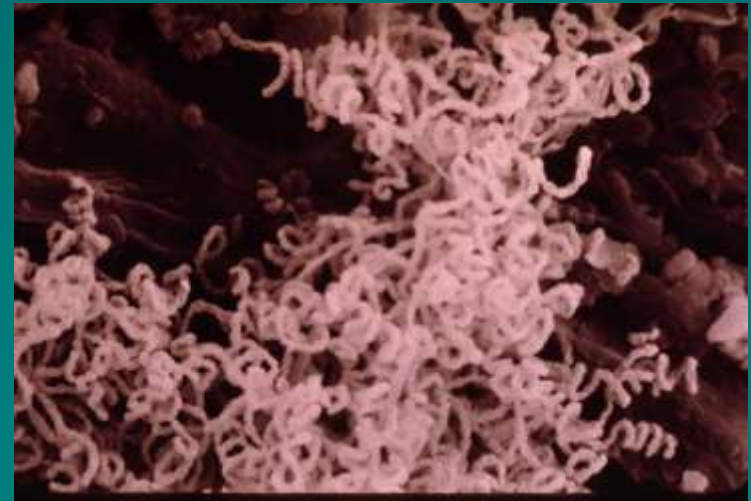
- Uppermost layer (O horizon)
 - Mainly plant litter in various states of decay and humus
- Topsoil (A horizon)
 - Aggregates made of mineral particles and humus cement
- These layers are alive!
 - A teaspoon of healthy soil can contain 100 million to 1 billion bacteria!
 - That is the same mass as 2 cows/acre!

What do soil microbes do?

- Nutrient cycling
 - Fixing— convert nitrogen gas from the air to forms plants can use
 - Nitrifying – convert ammonia to nitrate
 - Denitrifying – convert excess nitrate to nitrogen gas
- Decompose organic material + compounds
- Disease suppression
- Provide the “glue” to stabilize aggregates



Bacteria, Michael T. Holmes, Oregon State University



Actinomycetes J.P. Martin et al., 1976 SSSA, Madison, WI

Where are chemicals stored and transported in soil?

- Solid Phase
 - Organic matter
 - Charged minerals
- Liquid phase
 - Water films
 - Macropore flow
- Vapor phase
 - Very important for N_2 and VO's



Soil is essential to recharge quality and quantity...

- A healthy soil will :
 - Allow water to infiltrate
 - Be porous enough to allow percolation
 - Store and moderate water creating steady baseflows
 - Filter water by storing or degrading chemicals

... which provides us with a supply of clean water essential to human life!