

**Geology Sildes
For Petroluem & Civil Eng.**



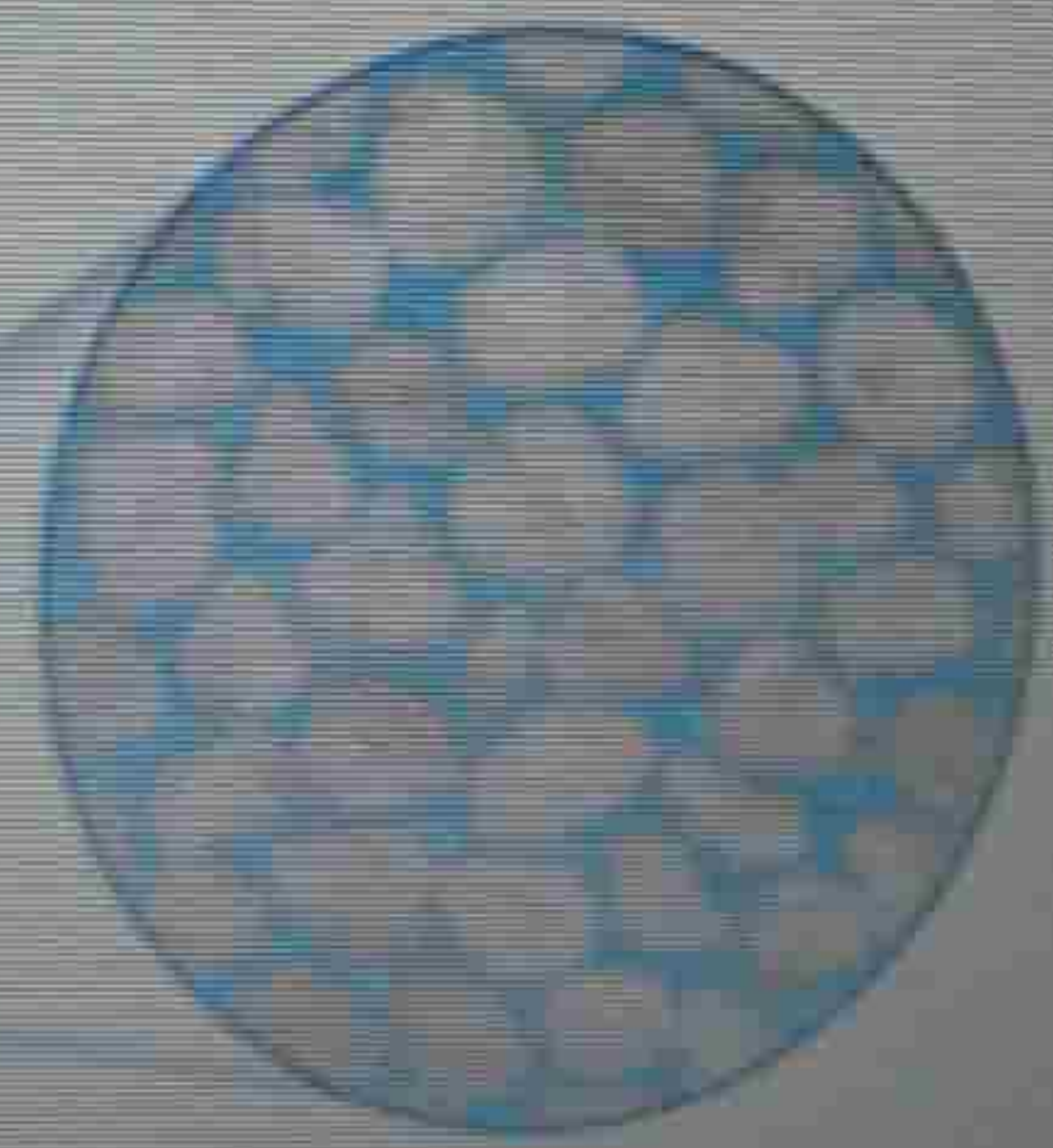
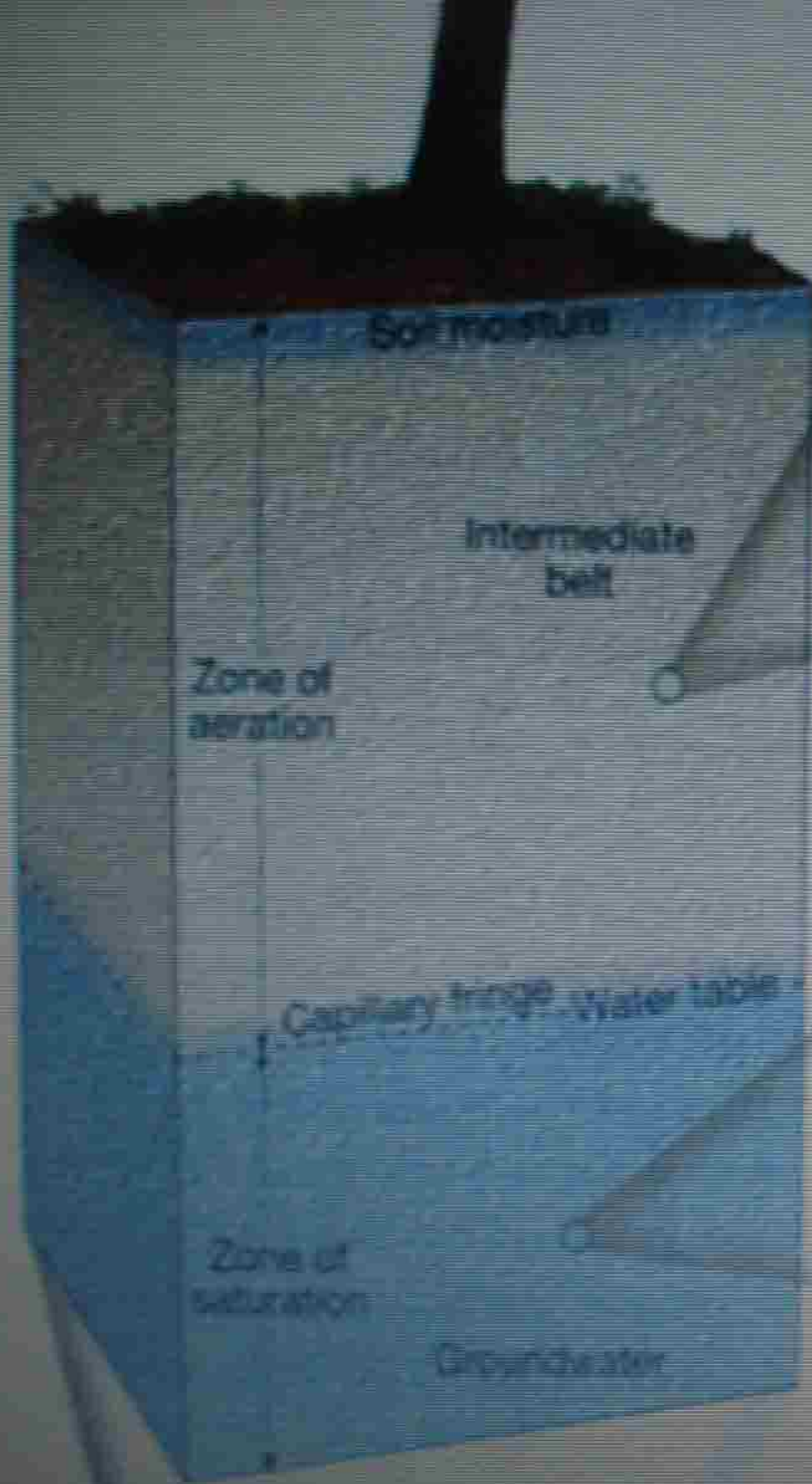
CHAPTER 17

GROUNDWATER

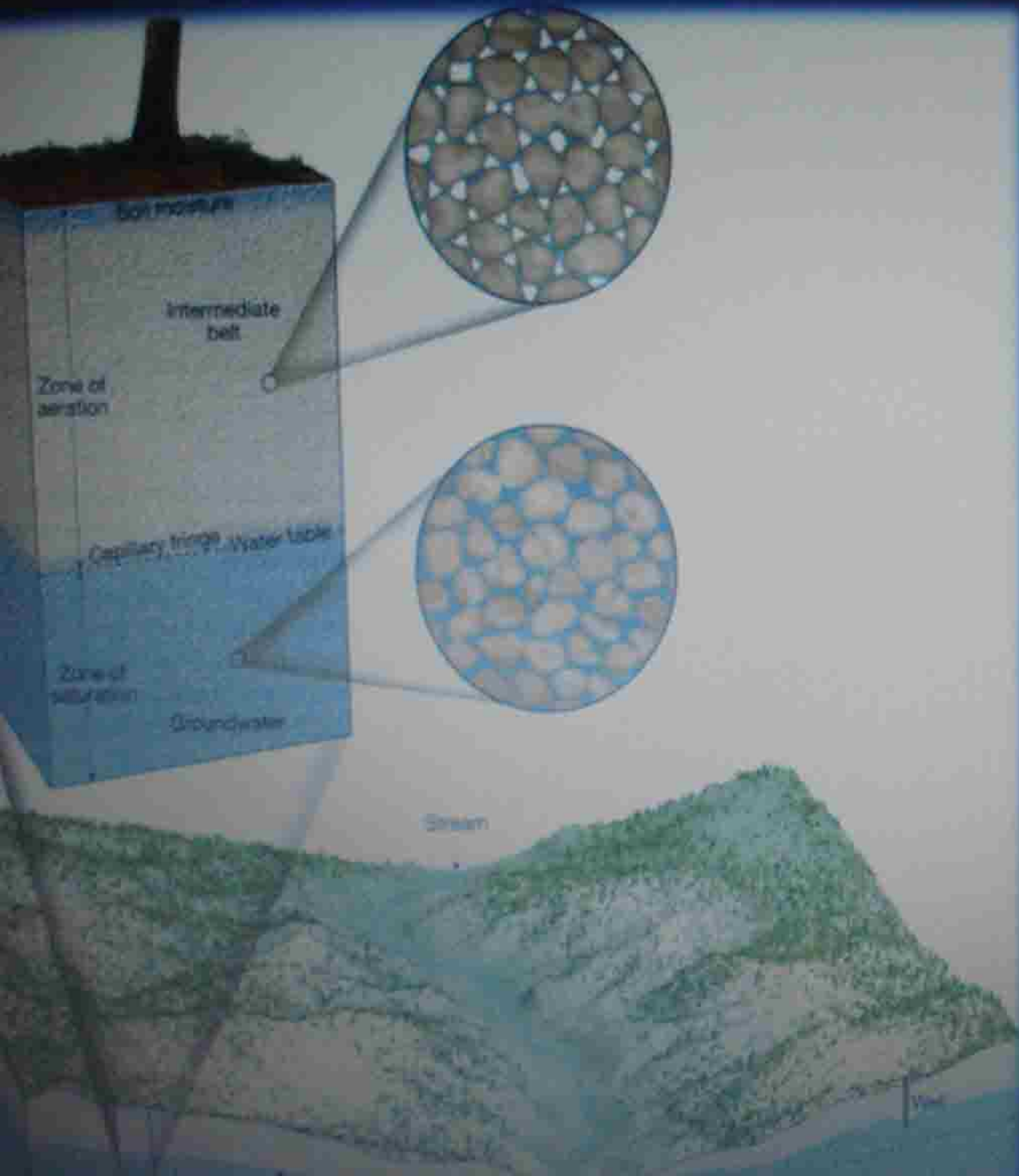
- ◆ **Groundwater:** water located beneath the ground surface in soil pore spaces and in the fractures of geologic formations.
- ◆ Most groundwater comes from precipitation. Typically 10 to 20% of precipitation enters aquifers.
- ◆ **Aquifer** is a subterranean geologic unit (or layer) of permeable material (like sand and gravel) that is capable of providing usable quantities of water to a well.

Groundwater

- Water percolates soil downward until it reaches a zone where all of the open spaces in sediment and rock are completely filled with water = **Zone of Saturation.**



Distribution of underground water.



Factors Influencing Storage and Movement of Groundwater

- ◆ **Porosity:** The volume of open spaces in rock or soil. It depends on:
 - size and shape of grains
 - how they are packed together
 - the degree of sorting
 - amount of cementing material.
- ◆ **Permeability:** ability to transmit a fluid.





GRAVEL



Some to yield

Fast drainage

FINE SAND



Some to yield

Moderate drainage

CLAY



Some to yield

Slow no drainage

Solid rock

Impervious

- ◆ **Hot Springs:** a spring that is produced by the emergence of geothermally-heated groundwater from the Earth's crust.
- ◆ **Geysers:** intermittent hot springs or fountains in which columns of water are ejected with great force at various intervals, often 30-60 meters into the air (Yellowstone National Park, USA).

Hot Springs



Humans and Monkey



Geyseers



Caverns, Sinkholes and Karsts

- ◆ **Karst Topography:** many areas of the world have landscapes shaped by the dissolving power of groundwater.
- Karsts areas typically have irregular terrain punctuated with many depressions, called **Sinkholes** or Sinks.
- Sinkholes act like passage to form caverns.

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- Karsts areas typically have irregular terrain punctuated with many depressions, called **Sinkholes** or Sinks.
- Sinkholes act like passage to form caverns.
- ◆ **Cavern**: a naturally formed underground chamber or series of chambers formed by solution activity of limestone.



Sinkholes

Caverns

Pothole

Shale
Limestone

Water table

