

Cave Formation Theories YouTube Lecture Handouts for Competitive Exams

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Zones of Water Table

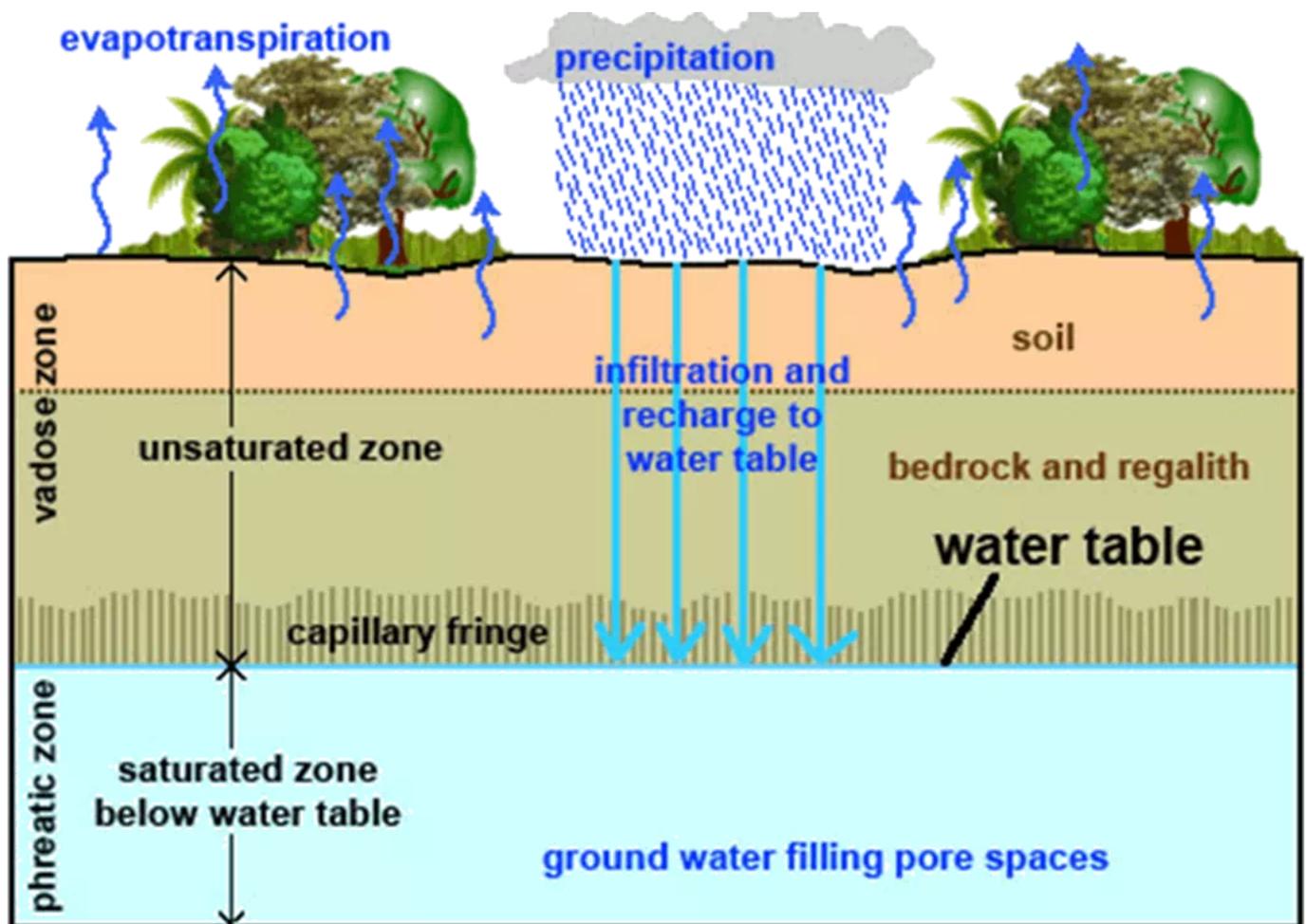


Image of Zones of Water Table

- Phreatic zone or zone of saturation: Area in an aquifer, below the water table, in which relatively all pores and fractures are saturated with water. It defines the lower edge of the vadose zone.
- Vadose zone or unsaturated zone: Part of Earth between land surface and top of phreatic zone. At this zone groundwater is at atmospheric pressure.

Cave Formation

Three classes of caves sculpturing process:

- **By pressure or flow**: Mechanical pressure include lava tunnels associated with volcanoes (e.g., Catacombs Cave in Lava Beds National Monument, California, USA) and badland caves by hydraulic pressure (e.g., caves of arid Badlands of South Dakota, USA)
- **By erosion**: Shoreline grottos created by mechanical action of waves (e.g., La Jolla sea caves near San Diego, California, USA) and rock shelters cut by river meanders (e.g., sandstone alcoves of cliff-dwelling Pueblo Indians, SW USA).
- **By solution**: Ice caves associated with glaciers and limestone caves (the most common ones)

Types of Cave Formation Theories by Solution

Speleogenesis: Origin and development of caves

- **Vadose Theories** - Dwerry House, Greene, Matson, and Malott
- **Deep Phreatic Theories** - Cvijic, Grund, Davis & Bretz
- **Shallow Phreatic Theories** - Swinnerton, Rhoades and Sinacori, and Davies
- **Static Water Zone Theory** - Gardner

Water table theory is given by Swinnerton and explains that rapidly moving water at the water table is responsible for the solution of most caves. Gardner based his “static water zone” theory of cavern development on the concept that dissection of permeable strata was responsible for initiating groundwater movement and solution of caverns.

Malott gave the invasion theory of cavern development and maintained that most cavern development takes place above the water table where groundwater velocity is greatest.

Davis gave the two cycle theory and said that cave initiation and most cavern enlargement occur at random depth below the water table while second cycle of cavern development may occur when the water table has been lowered by surface denudation.

-Manishika