

Some notes on groundwater

Ground water is important

- water supply for human consumption
- agricultural water
- clean air and water are the keys to a healthy ecosystem
- ground water can cause construction and foundation problems
- ground water can cause landslides

Ground water cycle includes surface phenomena in the soil layers, recharge, transport & discharge

Surface phenomena include **runoff** (water flowing on the surface), **evapo-transpiration** (water vapor passing into the atmosphere), and **infiltration** (water seeping down toward the water table)

Porosity is the percent of a given volume of rock that is empty or void space between grains.

Permeability is a measure of the ease with which a fluid can flow through a rock.

The **water table** is the surface between the unsaturated (aeration) zone and the saturated zone in which 100% of the pore space is filled with water.

The shape of the water table is generally a subdued replica of the shape of the ground surface. This is most valid for near-surface unconfined aquifers.

An **aquifer** is a rock layer from which water can be produced at a profit.

An **aquitard** is a rock layer through which water flows very slowly, due to very low permeability.

Recharge is the replenishing of an aquifer with water that has infiltrated from the surface or flowed from other water-bearing formations

An **unconfined aquifer** has uninterrupted fluid-air connection vertically to the ground surface. A bucket of sand could be used as a model of an unconfined aquifer.

A **confined aquifer** has a relatively impermeable layer between the aquifer and the ground surface. A bucket of sand with a layer of clay or plastic on top of the sand could be used as a model of a confined aquifer.

Springs occur when the water table intersects the ground surface, so that water flows out of the ground.

An **artesian spring** is associated with a confined aquifer from which water flows at the surface under its own pressure.

Evaporites are minerals that precipitate at/near the ground surface as the water in which the constituent ions were dissolved evaporates.

Wells may be pumping wells, injection wells or monitoring wells (aka *piezometers* or *manometers*). A pumping well in an unconfined aquifer will cause development of a cone of depression in the water table.

Dissolution of subsurface rock by acidic ground water might lead to the development of **caves**, **sinkholes**, solution cavities, or **karst** topography.

Precipitation of mineral material carried in solution by ground water can cause pores to be filled with new mineral material and cemented shut.

Groundwater problems that require engineered solutions: **ground water pollution, salt water intrusion, subsidence.**