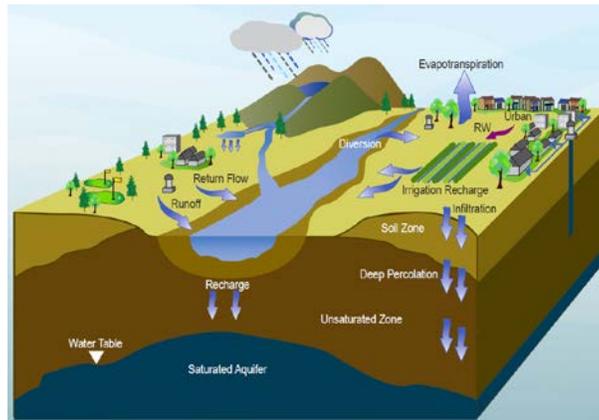


Definitions

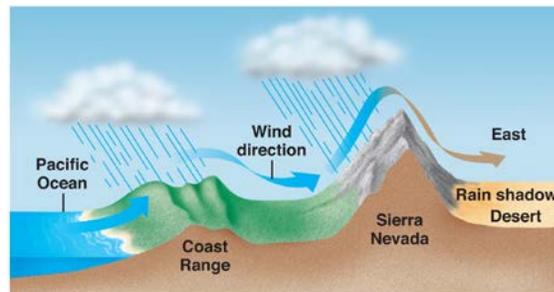
- Hydrologic Cycle - is a conceptual model that describes the storage and movement of water on earth
- Water Budget

$$P = ET + RO + GW + \Delta S$$



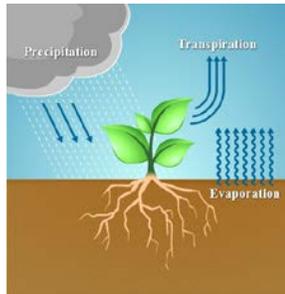
- **Drainage basin** is an extent or an area of land where surface water from rain, melting snow, or ice converges to a single point at a lower elevation, usually the exit of the basin, where the waters join another waterbody, such as a river, lake, reservoir, estuary, wetland, sea, or ocean.

Precipitation



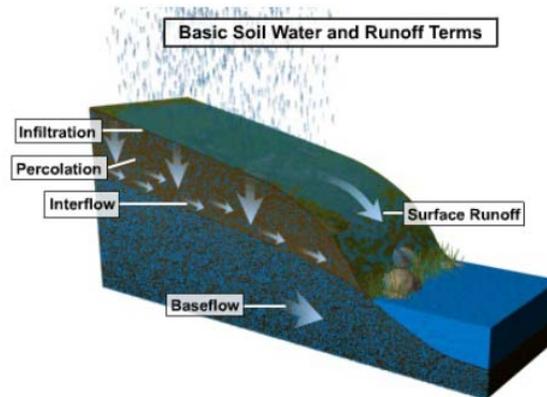
- **Precipitation** - is any product of the condensation of atmospheric water vapor that falls under gravity. The main forms of precipitation include drizzle, rain, snow and hail.
- **Hyetograph**: is a graph of cumulative precipitation through time
- **Intensity**: precipitation over time
- **Frequency**: Probability of occurrence of a determined rainfall event
- **Return Period**: how frequent (in year) a determined rainfall event happen
- **Interception**: Part of the precipitation which wets or adheres to above ground objects until return to the atmosphere through evaporation or sublimation

Evapotranspiration



- **Evaporation:** Transfer of water from land and water masses to the atmosphere
- **Transpiration:** The process by which the plant extract water from the soil, utilize it, and expel it to the atmosphere
- **Evapo-transpiration (ET):** Combined process of evaporation and transpiration. It is dependent upon many factors including: soil cover, vegetation, solar radiation, humidity, wind, etc.
- **Reference Evapotranspiration “ET₀”:** The reference crop evapotranspiration represents the evapotranspiration from a standardized vegetated surface.

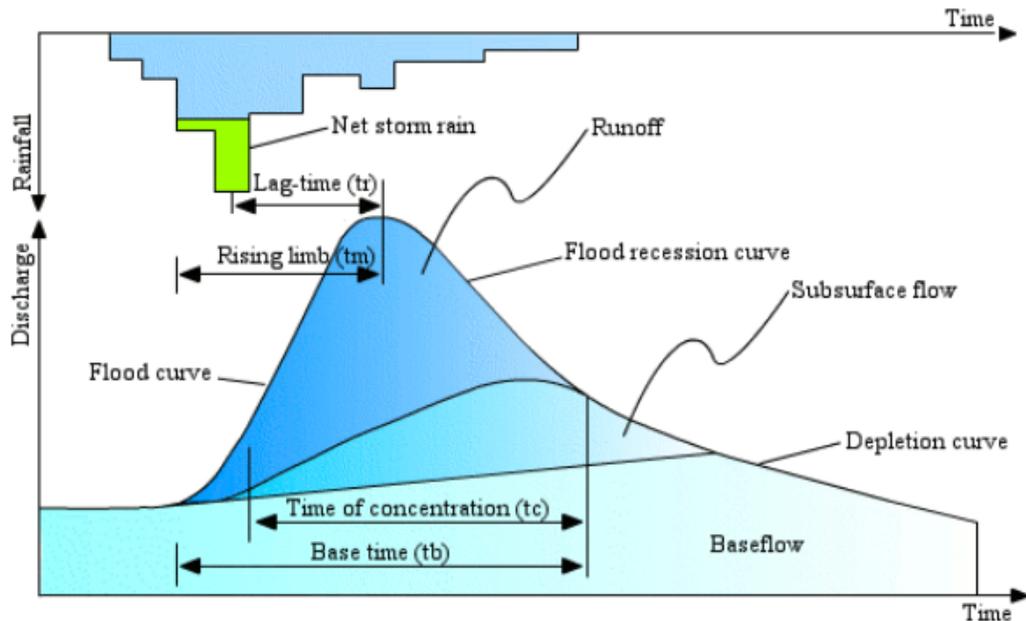
Runoff



- **Infiltration:** Process by which precipitation moves downwards through the surface and replenishes soil moisture, recharges aquifers and supports streamflows during dry periods
- **Runoff:** is often defined as the portion of rainfall, snowmelt, and/or irrigation water that runs over the soil surface toward the stream rather than infiltrating into the soil. It is sometimes called surface runoff.
- **Baseflow**, or base runoff, is the long-term supply of water that keeps at least some water in the stream even during extended dry periods. Baseflow comes from water that percolated down into deep storage.
- **Infiltration** is the downward movement of water through the soil surface. While it is often used interchangeably with **percolation**, percolation actually refers to movement of water *within* soil, and infiltration specifically refers just to the process of water entering a soil surface.
- **Surface runoff** is the movement of water across the soil surface toward the stream channel.

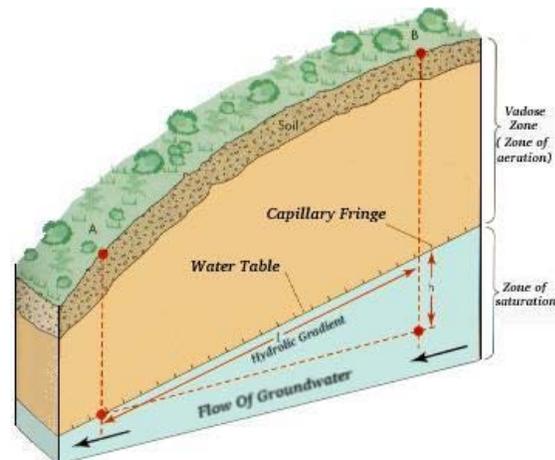
- **Interflow** is the relatively rapid movement of water below the soil surface toward the stream channel, typically within 72 hours of when water infiltrates the surface. This process is more likely in areas with deep soil.
- **Continuity Equation: $Q = V \times A$ (Flow rate = Velocity X Area)**

Hydrograph



- The **peak rainfall** is the time of highest rainfall. The **peak discharge** (the time when the river reaches its highest flow) is later because it takes time for the water to find its way to the river (**lag time**). The normal (**base**) flow of the river starts to rise (**rising limb**) when run-off, ground and soil water reaches the river. Rock type, vegetation, slope and situation (ie is this an urban river?) affect the steepness of this limb. The **falling limb** shows that water is still reaching the river but in decreasing amounts. The run-off/discharge of the river is measured in m^3/s - this stands for cubic meters per second. Precipitation is measured in mm - this stands for millimeters.

Groundwater



- **Groundwater** is simply water that fills empty pore spaces between the grains, sands, and gravels in our sedimentary basins
- **Aquiclude:** contains water but cannot transmit it rapidly enough to furnish a significant supply to a well or spring.
- **Aquitard (“confining unit” or “confining layer”):** low-permeability zone that retards, but does not prevent, the flow of water. It does not readily yield water for beneficial uses but can serve as a ground water storage unit.
- **Aquifuge:** Contains no geologic openings and cannot hold, transport water
- **Porosity:** percentage of porous space in the media (soil).
- Darcy’s Law:

$$Q = A \left(K \times \frac{h}{l} \right)$$

Volume of Water (Flow rate) \rightarrow Q
 Vertical Drop \rightarrow h
 Cross-sectional area of flow \rightarrow A
 Hydraulic Conductivity \rightarrow K
 Flow Distance \rightarrow l

- Hydraulic Gradient: groundwater flow velocity is proportional to the slope of the water table – steeper slope result in larger pressure difference between two points
- Hydraulic conductivity – Corrects for permeability difference between materials & viscosity of the solution
-
- Change in Storage
- Drainage Basin: is an extent or an area of land where surface water from rain, melting snow, or ice converges to a single point at a lower elevation, usually the exit of the basin, where the waters join another waterbody, such as a river, lake, reservoir, estuary, wetland, sea, or ocean.
- Atmospheric River - are relatively narrow regions in the **atmosphere** that are responsible for most of the horizontal transport of water vapor outside of the tropics