

Let's Talk Water – Water Definitions

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A number of people have asked me to write an article that provides definitions for the hydrologic terms they hear in meetings and read in reports. For example, the term “ET” is used a lot. No, it is not referring to a little alien in a science fiction movie; it refers to evapotranspiration, which is a really important component in the hydrologic budget.

Therefore, I have put together a list of some of the more common hydrologic terms. You can cut this article out and keep it as a handy reference if you want to impress your hydro-savvy friends.

Adsorption – Attraction of fluids, such as water and contaminants, to rocks and sediments.

Alluvium – Sediments deposited by rivers. These sediments typically fill valleys between mountain ranges in Nevada.

Aquifer – Rock or sediment that is saturated and can transmit sufficient water to supply wells.

Aquifer test – A test performed by pumping a well for some length of time and observing change in head in the aquifer (amount of change in the water levels in observation wells).

Aquitard – A geologic layer that has a low permeability and can transmit water slowly to adjacent aquifers.

Artificial recharge – Adding water to an aquifer through injection to wells or by adding water to ponds.

Baseflow – The portion of streamflow that comes from ground water discharge.

Capillary fringe – Saturated area above the water table where water is drawn upward by capillary action (water resists the pull of gravity due to attraction between water molecules and surrounding sediment).

Confined aquifer – An aquifer that is overlain by a layer of low-permeable material (such as clay or fine silt) that inhibits the movement of water through it.

Confining unit – The geologic layer of low permeability that is adjacent to an aquifer and prohibits flow into and out of the aquifer (can be either above or below an aquifer)

Connate water – Deep water in an aquifer that has been out of contact with the atmosphere for a long period of time.

Contaminant – An addition to water that makes it unusable for a specific use.

Darcy's Law – Equation used to calculate properties of ground-water flow.

Discharge – Volume of water flowing in a stream or moving through an aquifer at some specific time. For ground water, discharge often is used to describe water leaving a system (due to ET, baseflow, and ground-water flow out of a basin).

Drainage basin – Area in which surface runoff (precipitation and snowmelt) drains into a single surface-water body.

Drainage divide – Boundary line (highest elevation) separating drainage basins.

Drawdown – Lowering of water level or potentiometric surface by pumping a well.

Equipotential line – A line connecting points of equal water levels or potential head.

Evaporation – Process of water transforming from liquid to vapor.

Evapotranspiration – Combination of evaporation and transpiration. Evapotranspiration often is abbreviated as ET.

Finite-difference model – A digital computer simulation which divides an area based on a grid of rectangular cells and attempts to mimic actual conditions.

Flow net – A set of intersecting equipotential lines and flow lines used to show directions and gradients of ground-water flow.

Gaining stream – A stream whose flow is increasing due to inflow from ground water.

Ground water – Water held in spaces, pores, and openings in rocks and sediments beneath the surface of the earth. Ground water often is abbreviated as GW.

Ground-water mining – Withdrawing ground water at a rate exceeding natural recharge.

Hardness – Amount of calcium, magnesium, and iron in water. Hardness makes it difficult for soap to form lather.

Head – Water level in an unconfined aquifer or amount of pressure (potential) in a confined aquifer. Head typically is the measure of elevation of a water level in a well open to either a confined or unconfined aquifer. Often referred to as hydraulic head.

Hydraulic conductivity – Rate at which water can move through a permeable material. Hydraulic conductivity often is abbreviated as K.

Hydraulic gradient – Change in head over distance, usually measured as water levels in wells and shown as difference in heads over that distance. Hydraulic gradient often is abbreviated as dh/dl .

Infiltration – Movement of water from the earth's surface into the ground.

Karst – Openings in rocks, typically in carbonate (limestone) rocks, caused by dissolution of the rock. Karst is most often referred to as caves and caverns.

Lossing stream – A stream whose flow is decreasing due to infiltration into the ground.

Model – A representation of the real world. Hydrologists often use various models for explaining a system. Conceptual models try to explain what variables affect the inputs and outputs of a system (where the water is going). Numerical or digital models try to quantify those variables.

Model calibration – Process of changing values in a model, such as hydraulic conductivity, in order to match the model to known variables, such as water levels.

Observation well – A well used to observe water levels or heads in aquifers. These wells can be of various diameters and can also be used to collect water samples.

Perched aquifer – Ground water that is trapped or “perched” above the water table due to a clay layer (or zone of low permeability) separating the two.

Phreatophyte – A plant that has a taproot extending to the water table. Indicates a relatively shallow water table.

Porosity – Ratio of volume of void spaces (pores) to total volume of a sediment or rock. Porosity can affect the amount of water that can be held by the sediment or rock.

Potentiometric surface – Surface to which water would rise in a well open to a particular aquifer. In a confined aquifer, the potentiometric surface is above the top of the aquifer.

Recharge – Usually refers to water entering a ground-water system. Infiltration of precipitation and streamflow often are components of recharge.

Runoff – Total amount of water flowing in a stream. Often, when referring to precipitation, the water infiltrates, becomes runoff, and/or returns to the atmosphere through ET.

Safe yield – Refers to the amount of water that can be withdrawn from an aquifer without impairing water quality or creating undesirable effects from lowering water levels (such as environmental damage). Safe yield needs to be a balance between water withdrawn and recharge or leakage from surrounding units. The terms “safe yield” and “perennial

yield” are open to various interpretations and remain a point of contention between water professionals.

Semiconfined aquifer – Also referred to as a leaky confined aquifer; an aquifer where the confining unit allows a certain amount of discharge and recharge to occur.

Specific yield – Ratio of the volume of water either sediments or rocks will produce due to gravity drainage to the total volume of the sediments or rocks. In unconfined aquifers, specific yield represents how much water will come out of storage during pumping.

Specific storage – This term refers to how much water will go into or out of a porous medium (such as an aquifer) per unit volume of the medium per unit change in head. In other words, if you pump an aquifer and lower the head, specific storage is the amount of water that will come from the aquifer due to the change in head. Specific storage is often abbreviated as Ss.

Spring – Point of ground-water discharge to the surface. There are many different types of springs, depending on the type of feature that causes the spring. For example, a water table spring is where the water table intersects the land surface (often on a steep slope), a fracture spring occurs where a bedrock fracture intersects land surface, and a bedding spring is where water runs along the top of a geologic bed and discharges to the surface where the bed outcrops.

Storativity – The volume of water that an aquifer can take in or release per unit surface area of the aquifer per unit change in head. This is specific storage times the aquifer thickness. Storativity often is abbreviated as S.

Transmissivity – Rate of water movement through a unit width or thickness of aquifer. Transmissivity often is abbreviated as T. T is equal to hydraulic conductivity (K) times aquifer thickness. Transmissivity is essentially a measure of the aquifer’s ability to transmit water.

Transpiration – Process of plants taking up ground water and soil moisture from their roots and emitting water vapor through their leaves.

Unconfined aquifer – Aquifer with direct connection to the atmosphere (no confining unit between aquifer and the earth’s surface. Water level in an unconfined aquifer is referred to as the water table.

Vadose zone – Zone of unsaturated rock or sediments above the water table.

Water budget –The summary of recharge and discharge components to either a drainage basin or an aquifer. Recharge minus discharge should equal zero, plus or minus changes in storage.

Water table – Water level in an unconfined aquifer.

Well casing – Pipe (usually steel or PVC plastic) used to keep well open through sediments and unstable rock.

Well log – A log (list) of geologic material encountered during well construction, listed from land surface to the bottom of the well.

Well screen – Well casing with slots or holes to allow water to enter the well while keeping sediment out. Typically used in unconsolidated sediments and unstable rocks.

Xerophyte – Desert plant that requires minimal amounts of water and has an extensive shallow root system.

Obviously, there are many more definitions concerning hydrology, but these terms listed will help with most discussions. If you have any other terms you would like defined or have any other hydrology questions, please contact me through the Ely Times or at mstrobels@usgs.gov.