

World Water Supply: The Coming Crisis

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A Glossary of Water Terminology

Listed below is a selection of terms encountered in this course and likely to be unfamiliar to some or most participants. Following the listing I have compiled, I am also including a useful glossary published by the [State of Minnesota, Department of Natural Resources](#). At the end of that list are URLs for several other useful glossaries of water terminology.

Acequia A Spanish term for a small gravity driven irrigation and water supply canal, in New Mexico *acequias* supply much of the water used in Santa Fe and in other settlements.

Adiabatic lapse rate The change in air temperature with altitude. Actual rates are more complicated to calculate but the dry adiabatic when the air is not saturated and precipitation is not occurring is about $-6.49^{\circ}\text{C}/1,000\text{ m}$ (-3.56°F or $-1.98^{\circ}\text{C}/1,000\text{ Ft}$). The wet adiabatic when rain is falling is typically around $-5^{\circ}\text{C}/\text{km}$ ($-2.7^{\circ}\text{F}/1,000\text{ ft}$) of altitude gain.

Acre-foot An archaic measurement still used for irrigation and the pricing of water in the United States, an acre-foot is the amount of water necessary to cover an acre of ground one foot deep (approximately 1,233,490 liters or to use another archaic measurement 325,850 gallons).

Appropriative rights Water rights assigned to the first users of water in arid areas. The time of first use rather than location adjacent to a stream defines the right. The US Bureau of Land Management (BLM) has a more elaborate definition of [appropriative rights](#) and water rights in the US.

Aquifer A natural underground reservoir of water which varies greatly in size from tiny amounts trapped in local rock formations to immense water deposits like that incorporated in the [Ogallala Aquifer](#) under the Great Plains of the US.

Arid Climate The climate of an area where annual evapo-transpiration exceeds precipitation. In mid-latitude areas that usually means annual precipitation of 400 mm or less.

Artesian basins and wells Underground water under pressure in aquifers. When released it will flow. Quite common when aquifers have a significant slope, a most dramatic example is Australia's Great Artesian Basin encompassing the eastern Interior of the Island Continent.

Basin More or less identical to **watershed**, the area from which a stream gathers its water. **Basin** is usually applied to larger rivers.

Blue water (Not as it is used in the Maritime trades) Water drawn from lakes and streams for use in agriculture (see green, brown and grey water)

Brown water Water that has been used for human purposes and unless treated contains sewage or other materials potentially hazardous to human and animal health.

Consumptive use Water removed from streams, lakes or rivers for use and lost to evapo-transpiration or incorporated in a commodity and thus not returned to that water body.

Contamination The presence in water of substances that make it useless or difficult to use for human purposes. Natural processes can lead to contamination as can human activities so it is a broader term than **pollution**.

Discharge The amount of water flowing at the mouth of a stream as it flows into the ocean, a lake or another stream.

Drought A prolonged period of lower than long-term average precipitation, a notoriously difficult term to define exactly.

Evapo-transpiration Liquid water lost to the through the evaporation from land and water surfaces and to the transpiration of water from vegetation.

Exotic river A river which gains most of its flow in a humid, usually a high elevation, area and then passes through a region where **evapo-transpiration** exceeds rainfall. Examples include the Indus River in Asia, the Nile in Africa, and the Columbia and Colorado Rivers in North America. The term was coined by the geographer Edward Ullman.

Fossil water Water collected in past geological and climatic eras and stored in underground aquifers (Ogallala aquifer) or lakes (the Great Lakes). Rainfall and rates of *recharge* (see below) are inadequate to create similar deposits or to replace the water if the water should be drawn down beyond current rates of recharge.

Green water Precipitation water used directly in agriculture.

Grey water Water that has been used for human purposes and contains contaminants but does not contain sewage or other materials considered hazardous to human or animal health.

Ground water Water stored in underground aquifers.

Humid climate The climate in an area where annual precipitation exceeds evapo-transpiration. The term is usually applied to areas where precipitation is adequate to allow rain-fed agriculture dependent solely on **green water** without application of additional water.

Hydrology The study of water flow, a branch of the earth sciences.

Hydraulic civilizations Past societies that have depended on and developed around large scale water management projects. The term was introduced by the scholar of Asian cultures Karl Wittfogel.

Hydrograph A graphic display of changes over time showing water levels in a ground water basin or reservoir.

Interbasin transfers The movement of water from one watershed (basin) into another. In practice the term is mostly used when water is moved between basins of large streams draining into different water bodies thus interbasin transfers of Great Lakes water normally draining into the North Atlantic Ocean into the Mississippi drainage into the Gulf of Mexico (as happens at Chicago) or of Colorado River (Gulf of Cortez to Platter River (Mississippi) near Denver.

Interfluve The division line between two watersheds, generally following the height of land.

Limnology The study of lakes.

Orographic rainfall Rain caused as saturated air rises over a range of hills or mountains and cools. Orographic rainfall is common on the windward side of mountain ranges, especially those close to major water bodies like the Sierra Nevada in California and the Cascades in Oregon and Washington.

Qanat (transliteration spellings of this Farsi word vary)An underground channel in an alluvial deposit used to collect water in arid areas. Common in Iran and the Middle East, qanats are marked on the surface by lines of wells.

Rain shadow The area on the leeward side of a mountain range where descending air creates arid conditions after rising air on the windward side has caused **orographic precipitation**. There are numerous examples in the United States, especially the areas immediately to the east of the Sierra Nevada and Cascade ranges in the Pacific Coast states. In Washington State the windward side of the Cascades may get upwards of 1,000 cm of precipitation a year while the leeward side gets 20 cm.

Recharge The replacement of water withdrawn from underground aquifers as rainfall received on the surface is absorbed.

Right to Water "In 1977, in Mar del Plata (Uruguay), an international action plan was developed and member states of the United Nations agreed that 'all peoples, whatever their stage of development and their social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs.'" <http://www.pej.org/html/print.php?sid=7541>

Riparian rights In humid areas riparian rights are the rights to use water in streams flowing across or adjacent to a property. It is assumed that the water withdrawn for use will be returned to the stream, and thus the flow will not be diminished. The US Bureau of Land Management (BLM) has a more elaborate definition of [riparian rights](#).

Subsidence The sinking of ground level. It can occur when an aquifer is drained and the once saturated ground sinks as it is compacted. The central area of Mexico City, built on a drained lakebed, has experienced substantial subsidence as evidenced by the varying levels of land in the once flat *Zocalo*.

Sustainable use Definition depends on context: 1) Sustainable use of an aquifer is the amount that can be withdrawn over a time period such that the total amount of water in the aquifer does not decline; that is **recharge** equals withdrawal. 2) Sustainable use of water from a stream is an amount withdrawn such that total discharge is not markedly reduced and the rights of downstream users are not infringed.

Watershed The area from which a stream or lake collects water. Precipitation from the watershed collects to form the stream or lake. See also Basin.

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Hydrologic terms

Hydrologic Terms and Definitions

Some of the text and graphics were adapted from the U.S. Corps of Engineers HEC -HMS Training Documents, 1999.

Acre-foot: the volume of water required to cover 1 acre to a depth of 1 foot. One acre-foot is equal to 43,560 cubic feet or 1,233.5 cubic meters.

Antecedent conditions: the conditions prevailing prior to an event. This description is normally used to characterize basin wetness.

Attenuation: the reduction in the peak of a **hydrograph** as it moves downstream, resulting in a more broad, flat hydrograph.

Base flow: the sustained flow in a channel because of subsurface runoff.

Calibration: the process of adjusting model parameters to known data.

Cubic feet per second (cfs): a cfs is equal to 0.0283 cubic meters per second (cms).

Channel: an open conduit either naturally or artificially created that may convey water.

Confluence: the point at which two streams converge.

Detention basin: storage site, such as a small unregulated reservoir, which delays the conveyance of water downstream (compare to *retention basin*).

Diffusion: dissipation of the energy associated with a floodwave. Diffusion results in the attenuation of the floodwave.

Direct runoff: the runoff entering stream channels promptly after rainfall, exclusive of base flow. Direct runoff equals the volume of rainfall excess (total precipitation minus losses).

Discharge: the volume of water that passes through a given cross section per unit time. Discharge is commonly measured in cubic feet per second (cfs) or cubic meters per second (cms). It is also referred to as *flow*.

Exceedence probability: hydrologically, the probability that an event selected at random will exceed a specified magnitude.

Excess precipitation: the precipitation in excess of infiltration capacity, evaporation, transpiration, and other losses. It is also referred to as *effective precipitation*.

Floodplain - lowland areas adjoining lakes, wetlands, and rivers that are susceptible to inundation of water during a flood. For regulatory purposes, the floodplain is the area covered by the 100-year flood or the area that has a 1 percent chance of flooding every year. It is usually divided into districts called the floodway and flood fringe. Areas where the floodway and flood fringe have not been determined are called approximate study areas or general floodplain. Local units of government administer ordinances that guide development in floodplains.

Flood stage - The **National Weather Service** defines flood stage as the river level that begins to impact life and/or property. River flood warnings will be issued when river levels are forecast to reach flood stage at any official national weather service river forecast location.

On March 1, 2006, the National Weather Service revised some Lower Minnesota River flood stages to more accurately reflect the above definition. The previous flood stages were established more than 40 years ago when major highways and numerous residences were located in the flood plain. The National Weather Service met with other federal state and local government officials and concluded that the many years and dollars spent on mitigation activities to elevate roads and bridges -- buy out homes -- build levees around cities -- and make businesses more flood resistant have raised the levels at which flood problems begin on the Lower Minnesota River.

Hydraulics: the mechanical properties of water and other liquids and the application of these properties in engineering.

Hydrograph: a description of flow versus time or a description of stage versus time.

Hydrologic cycle: the continuous process of water movement between the oceans, atmosphere, and land.

The hydrologic cycle is a process that occurs within the earth's atmosphere in which water molecules move and are transformed from liquid to vapor and back to liquid again. The cycle begins when an unending circulation of water begins as energy from the sun which evaporates enormous quantities of water from the oceans.

Atmospheric winds transport the moist air to other regions, where it condenses into clouds, some of which produce rain and snow. If the precipitation falls into an ocean, the water is ready to begin its cycle again. If the precipitation falls on a continent, a great deal of the water makes its way back to the ocean in a complex journey over land and underground.

See also **MPCA Hydrologic Cycle Diagram**

Hydrology: the study of water. Hydrology generally focuses on the distribution of water and interaction with the land surface and underlying soils and rocks.

Hyetograph: rainfall intensity versus time. A hyetograph is often represented by a bar graph.

Infiltration: the movement of water from the land surface into the soil.

Inflection point: generally refers to the point on a **hydrograph** separating the falling limb from the recession curve. It is any point on the hydrograph where the curve changes concavity.

Interception: the capture of precipitation above the ground surface, for example, by vegetation or buildings.

Isohyet: lines of equal rainfall intensity.

Lag time: the time from the center of mass of excess rainfall to the hydrograph peak. Lag time is also referred to as *basin lag*.

Model: a physical or mathematical representation of a process that can be used to predict some aspect of the process.

Optimization: derivation of a set of model parameters that produces the best results when compared to observed data.

Ordinary High Water Level (OHWL): See **definition**.

Parameter: a variable, in a general model, whose value is adjusted to make the model specific to a given situation.

Parameter estimation: the selection of a parameter value based on the results of analysis and/or engineering judgment.

Peak: the highest elevation reached by a flood wave. Peak is also referred to as the *crest*.

Peak flow: the point of the **hydrograph** that has the highest flow.

Peakedness: the rate of rise and fall of a hydrograph.

Provisional data (USGS): stage data that may have been affected by factors not accounted for at the time the stage was recorded. Further analysis is often required before data are deemed final.

Rating curve: the relationship between stage and discharge.

Reach: a segment of a stream channel.

Recession curve: the portion of the **hydrograph** where runoff is predominantly produced from basin storage (i.e., subsurface and small land depressions). It is separated from the falling limb of the hydrograph by an inflection point.

Retention basin: similar to a detention basin but water in storage is permanently obstructed from flowing downstream.

Stage: the elevation of a water surface in relation to a datum.

Time of concentration: the travel time from the hydraulically furthest point in a watershed to the outlet. This is also defined as the time from the end of rainfall excess to the recession curve inflection point as illustrated on the accompanying hydrograph.

Time of rise: the time from the start of rainfall excess to the peak of the hydrograph.

Time to peak: the time from the center of mass of the rainfall excess to the peak of the hydrograph. It is also referred to as *lag time*.

Unit hydrograph: a direct runoff hydrograph produced by one unit of excess precipitation over a specified duration. For example, a 1-hour unit hydrograph corresponds to one unit of excess precipitation occurring uniformly over an hour.

Watershed - an area characterized by all direct runoff being conveyed to the same outlet. Similar terms include *basin*, *subwatershed*, *drainage basin*, *catchment*, and *catch basin*.

Additional Useful Web Glossaries of Water Terminology

The [Geography Department at the University of Wisconsin at Stevens Point](#) has a good website put together by Michael Ritter in which a number of geomorphological and other water related terms are defined and illustrated with clear and simple line drawings. *Recommended.*

For another and longer list of terms see the [Water Basics Glossary](#) published online by the U. S. Geological Survey. (USGS).

The [State of Nevada Division of Water Resources](#) also has a lengthy and useful glossary.