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G93-1191 Glossary of Water-Related Terms

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Glossary of Water-Related Terms

This NebGuide is a glossary of water quantity, quality and human health related terms involving water. Terms are defined in contexts that could affect Nebraskans.

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- [A Glossary of Terms](#)

We depend upon water for our very existence. The impact of water quality and quantity issues has never been greater. Yet the terminology used to describe the water we drink, the water we provide to plants and animals, the water stored underground, in lakes, rivers, and oceans, is not well understood by many Nebraskans.

This listing of water-related terms is intended to reduce the potential for misunderstanding presentations made by elected officials, environmental agencies and news reporters. The definitions and associated explanations provide working knowledge of Nebraska's water. Some terminology could be defined differently to describe water supply issues in other locations in the world.

A Glossary of Terms

A

Absorption is the process by which chemicals in gaseous, liquid or solid phases are incorporated into and included within another gas, liquid, or solid chemical. For example, sponges absorb water.

Acceptable daily intake (ADI) is the chemical ingestion level determined by combining the maximum No-Observed-Adverse-Effect-Level (NOAEL) with the addition of an uncertainty (safety) factor. Chemicals with ADI levels usually are not considered or suspected to be carcinogens. This classification results from toxicity data collected during prolonged ingestion studies conducted on a number of animals.

Acre-foot is the volume of water (325,851 gallons of water) required to cover one acre of land with 12 inches of water.

Adsorption is the adherence of gas molecules, ions or solutions to the surface of solids. For example, odors from freezers and refrigerators are adsorbed to baking soda.

Advection is the process by which chemicals and heat are transported along with the bulk motion of flowing gas or liquid. For example, nitrates move through soils and aquifer formations due predominantly to the bulk motion or movement of water.

Anion is a negatively charged chemical. Nitrate (NO_3^-) and chloride (Cl^-) are examples of anions.

Anion exchange is the chemical process where negative ions of one chemical are preferentially replaced by negative ions of another chemical. In water treatment, the net effect is the removal of an unwanted ion from a water supply. For example, some municipalities are installing anion exchange systems to remove nitrate (NO_3^-) from their water supplies.

Aquifer is the saturated underground formation that will yield usable amounts of water to a well or spring. The formation could be sand, gravel, limestone or sandstone. The water in an aquifer is called groundwater. A saturated formation that will not yield water in usable quantities is called an **aquiclude**. Most Nebraska aquifers may be categorized into **confined** and **unconfined** aquifers.

- **Confined aquifer** (artesian aquifer) is the saturated formation between low permeability layers that restrict movement of water vertically into or out of the saturated formation. Water is confined under pressure similar to water in a pipeline. Drilling a well into this type of aquifer is analogous to puncturing a pressurized pipeline. In some areas confined aquifers produce water without pumps (flowing artesian well). When pumping from confined aquifers, water levels often change rapidly over large areas. However, water levels will generally recover to normal when pumping ceases.
- **Unconfined aquifer** (water table aquifer) is the saturated formation in which the upper surface fluctuates with addition or subtraction of water. The upper surface of an unconfined aquifer is called the water table. Water, contained in an unconfined aquifer, is free to move laterally in response to differences in the water table elevations.

Artificial recharge is the unnatural addition of surface waters to groundwater. Recharge could result from reservoirs, storage basins, leaky canals, direct injection of water into an aquifer, or by spreading water over a large land surface.

B

Baseflow is that part of streamflow derived from groundwater flowing into a stream.

C

Capillary fringe is a zone of partially saturated material just above the water table. The depth of the fringe depends upon the size and distribution of the pore spaces within the geologic formation.

Cation is a positively charged chemical. For example, calcium (Ca^{+2}), and Magnesium (Mg^{+2}) are cations.

Cation exchange is a process where positively charged ions of one chemical are preferentially replaced by positive ions of another chemical. For example, water softeners replace Ca^{+2} , and Mg^{+2} ions with the sodium (Na^{+2}) ion.

Cone of depression is a depression in groundwater levels around a well in response to groundwater withdrawal or pumping water.

Contaminant is any unnatural biological, chemical, physical, or radiological substance or matter contained in water. Tri-chloroethylene (TCE) is a synthetic cleaning solvent sometimes found in groundwater near manufacturing sites.

D

Deep percolation is the movement of water below the maximum effective plant root zone.

Diffusion is a process where heat or chemicals are transported in response to differences in chemical concentration or temperature. Movement is from high concentration (or temperature) to low concentration (or temperature). This process could involve liquids, gases and solids.

Discharge area is an area where groundwater moves toward or is delivered to the soil surface. Groundwater can flow into springs, or seeps; contribute baseflow to streams; or provide supplemental water for plant use.

Dispersion is the process whereby a chemical, contained in water, deviates from the path that would be expected due to bulk flow. In the process the chemical is mixed with surrounding liquids, causing its concentration to be reduced.

Distillation is a two-stage water treatment method: 1) the liquid is boiled, producing water vapor; 2) the water vapor is condensed, leaving most contaminants behind. Distillation can be used to remove inorganic chemicals, some non-volatile organic chemicals, and bacteria.

Drawdown is a lowering of the groundwater surface caused by withdrawal or pumping of water from a well. It is the difference between the static water level and the pumping water level in a well pumped at a constant flow rate.

Drainage is the process of transporting surface water over a land area to a river, lake or ocean (surface drainage), or removal of water from a soil using buried pipelines that are regularly spaced and perforated (subsurface drainage).

E

Effluent is the discharge of a contaminant or contaminants with water from animal production or industrial facilities or waste water treatment plant.

Erosion is the process or series of processes that removes soils, crop residues, and organic matter from the land surface in runoff waters, or by wind. Water droplets begin the erosion process by detaching soil particles. Runoff waters transport the detached particles to local and regional streams or lakes. Soil erosion represents the single largest source of nonpoint pollution in the United States.

Eutrophication is the process of surface water nutrient enrichment causing a water body to fill with aquatic plants and algae. The increase in plant life reduces the oxygen content of the water. Eutrophic lakes often are undesirable for recreation and may not support normal fish populations.

Evapotranspiration (ET) is the process of changing soil water into water vapor through the combination of soil evaporation and plant water use, or transpiration. For more information consult NebGuide G90-992, *Evapotranspiration (ET) or Crop Water Use*.

F

Field capacity is the amount of water a soil contains after rapid drainage has ceased. It is the water content following a period of gravity drainage without the addition of water.

Fecal coliform is a portion of the coliform bacteria group originating in the intestinal tract of warm-blooded animals that pass into the environment as feces. Fecal coliform often is used as an indicator of the

bacteriological safety of a domestic water supply.

G

Gaining stream (effluent stream) is a stream or portion of a stream where flow increases because of discharge from groundwater.

Grains per gallon is a unit of measurement often used to describe water hardness. One grain per gallon is approximately equal to 17 ppm of various cations.

Groundwater (sometimes written as two words) is water that occupies voids, cracks, or other spaces between particles of clay, silt, sand, gravel or rock within the saturated formation.

Groundwater mining is the removal of groundwater from an aquifer in excess of the rate of natural or artificial recharge. Continued groundwater mining reduces the groundwater supply until it is no longer an economical source of water.

Groundwater recharge is the process where water enters the soil and eventually reaches the saturated zone. Recharge varies from place to place due to the amount of rainfall, infiltration, and surface vegetation.

H

Health advisory level (HAL) is a non-regulatory health-based chemical concentration in drinking water that results in no adverse health risks when a given amount of water is ingested over exposure periods ranging from one day to a lifetime.

Hydraulic conductivity is a term used to describe the ease with which water moves through soil or a saturated geologic material. Hydraulic conductivity is influenced by the type of material comprising the formation (sand, gravel, rock, limestone, sandstone, clay), the slope of the water table, the type of fluid, and the degree to which existing pores are interconnected.

Hydraulic gradient is the slope of the water surface in an aquifer. The hydraulic gradient indicates the direction groundwater will flow. Water always flows from higher water table elevations to lower water table elevations. All other factors being equal, flow is greater when the hydraulic gradient is steeper.

Hydrologic cycle describes the constant movement of water above, on, and below the earth's surface. Processes such as precipitation, evaporation, condensation, infiltration and runoff comprise the cycle. Within the cycle, water changes forms in response to the Earth's climatic conditions.

I

Infiltration is the downward entry of water into the soil. The infiltration rate is a function of surface wetness, soil texture, surface residue cover, irrigation application or precipitation rate, surface topography and other factors.

L

Leaching is the removal of dissolved chemicals from soil by the movement of a liquid (like water).

Losing stream (influent stream) is a stream or portion of a stream that discharges water into the groundwater.

Low permeability layers include soil, sediment or other geologic material that inhibit water movement. These layers may serve as a base material, or confining beds for an aquifer. The Pierre Shale serves as the base of many aquifers in Nebraska.

M

Maximum contaminant levels (MCLs) are legally enforceable drinking water standards required by the Safe Drinking Water Act. Standards set by the Environmental Protection Agency establish the maximum permissible concentration of selected contaminants in public water supplies. Contaminants are included on the list if they pose a public health risk. For example, 10 ppm is the MCL for nitrate-nitrogen ($\text{NO}_3\text{-N}$).

Maximum contaminant level goals (MCLGs) are public drinking water standards that serve as nonenforceable goals for selected contaminants contained in drinking water that pose no health risk to people over a lifetime of exposure. A MCLG is a suggested level set by EPA as a guideline for water utilities.

Methemoglobinemia or blue baby syndrome is the condition that limits the oxygen-carrying capacity of red blood cells. The condition occurs when bacteria in the digestive tract convert nitrate to nitrite. Nitrite reacts with hemoglobin in the blood, producing methemoglobin which cannot carry oxygen. The resulting oxygen starvation causes a bluish discoloration of the body. The condition is largely confined to infants less than 9 months old. Excessive amounts of nitrates may be ingested with water or food. Often foods, such as fresh vegetables, are a major source of nitrates.

N

Non-point source (NPS) pollution is the source of surface or groundwater pollution originating from diffuse areas without well-defined sources. The most common examples of NPS are chemicals that enter surface water during runoff events from cropland and turfgrass, and soil erosion from cultivated cropland and construction sites.

P

Part-per-million (ppm) is a measure of concentration of a dissolved material in terms of a mass ratio (milligrams per kilogram, mg/kg). One part of a contaminant is present for each million parts of water. For water analysis, parts per million often is presented as a mass per unit volume (milligrams per liter, mg/l). There are one million milligrams of water in one liter.

Perched water tables occur when a low permeability material, located above the water table, blocks or intercepts the downward flow of water from the land surface. Water mounds up above the impermeable material, creating another saturated zone with a water table.

Permeability is the property of porous materials indicating the ease with which liquids or gases will be transmitted through a soil or other porous material. Permeabilities are not affected by changing the type of liquid.

pH is a numerical measure of the acidity or alkalinity of water. The pH scale ranges from 1 (acidic) to 14 (alkaline). A pH of 7 is neutral.

Point-of-entry (POE) treatment is the treatment of all water entering a house, farmstead or other facility, regardless of its intended use. Anion exchange is an example of POE treatment to remove nitrates.

Point-of-use (POU) treatment is treatment of water at the point it is used. A common example would be water treatment at the kitchen sink for drinking and cooking uses. Reverse osmosis, distillation and ozone are

examples of POU treatment methods.

Point source (PS) pollution is the source of surface or groundwater pollution that originates from a well-defined source. Examples include: industrial effluent; large animal containment facilities; city waste water treatment discharges; or chemical spills. Point sources commonly are associated with pipeline discharges of some type.

Pollutant is any unwanted chemical or change in physical property that renders a water supply unfit for its intended use.

Porosity is the ratio of the volume of open spaces or voids to the total volume of a porous material. For example, a sand and gravel deposit may have 20 percent porosity. Porosity determines the amount of water that can be stored in a saturated formation. A saturated formation 100 feet thick with a porosity of 20 percent could store an equivalent water depth of approximately 20 feet.

Potable water supply is a source of water that can be used for human consumption.

Precipitation is the process where water vapor condenses in the atmosphere to form water droplets that fall to the earth as rain, sleet, snow or hail. Nebraska's long-term annual precipitation varies from 16 inches in the west to 34 inches in the southeast. Annual deviations can be greater than 30 percent.

Pumping water level is the water level in a well when the pump is operating and water is being removed.

R

Recharge area is the area where water predominantly flows downward through the unsaturated formation (zone) to become groundwater.

Reference dose (RfD) is the maximum daily exposure to a chemical that is judged to be without risk of adverse systemic health effects over a person's lifetime. It formerly was called the Acceptable Daily Intake.

Reverse osmosis (RO) is a water treatment method used to remove dissolved inorganic chemicals and suspended particulate matter from a water supply. Water, under pressure, is forced through a semipermeable membrane that removes molecules larger than the pores of the membrane. Large molecules are flushed into waste waters. Smaller molecules are removed by an activated carbon filter.

Runoff is precipitation or irrigation water that does not infiltrate but flows over the land surface toward a surface drain, eventually making its way to a river, lake or an ocean.

S

Saturated formation (zone) is the portion of a soil profile or geologic formation where all voids, spaces or cracks are filled with water. No air is present. There may be multiple water-bearing formations within a saturated formation. These water-bearing formations often are separated by layers of clay or other impermeable layers.

Saturated thickness (zone) is the total thickness of a saturated formation.

Seepage is the movement of water into or through a porous material. Seepage occurs from canals, ditches, and other water storage facilities. It sometimes is used to describe water escaping from municipal landfill sites.

Shock chlorination is the addition of chlorine for disinfecting a water supply system including the well, and all distribution pipelines. Shock chlorination is recommended when coliform bacteria are detected, or after system repairs. Treated water, with a concentration of at least 200 ppm, is pumped throughout the distribution system and allowed to set for at least 24 hours before flushing with untreated water.

Specific capacity expresses the productivity of a well. Specific capacity is obtained by dividing the well discharge rate by the well drawdown while pumping.

Specific yield is the ratio of the volume of water that will drain from a unit volume of aquifer by gravity flow. Most aquifers in Nebraska have specific yields between 0.20 and 0.25. That means 20 to 25 percent of the saturated formation contains water that may be removed by pumping.

Spring is the point of natural groundwater discharge to a soil surface, river, or lake.

Static water level is the water level in a well located in an unconfined aquifer when the pump is not operating. The static water level is the surface of the water-bearing formation and typically is synonymous with the water table.

T

Transmissivity is the capacity of an aquifer to transmit water. It is dependent on the water-transmitting characteristics of the saturated formation (hydraulic conductivity) and the saturated thickness. For example, sand and gravel formations typically have greater hydraulic conductivities than sandstone formations. The sand and gravel will have a greater transmissivity if both formations are the same thickness.

Total dissolved solids (TDS) is a water quality parameter defining the concentration of dissolved organic and inorganic chemicals in water. After suspended solids are filtered from water and water is evaporated, dissolved solids are the remaining residue. Dissolved solids commonly found in Nebraska water are calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride and silica. Total dissolved solid concentrations depend on the geologic material water passes through in the saturated and unsaturated zone, and the quality of the infiltrating water. Total dissolved solid contents range from less than 100 ppm in the Sandhills to greater than 1,000 ppm near the Missouri River in northeast Nebraska.

U

Unsaturated formation (vadose zone) is the soil or other geologic material usually located between the land surface and a saturated formation where the voids, spaces or cracks are filled with a combination of air and water.

W

Watersheds are regional basins drained by or contributing water to a particular point, stream, river, lake or ocean. Watersheds range in size from a few acres to large areas of the country. In Nebraska, Natural Resource Districts (NRDs) were established along watershed boundaries. In many cases an individual watershed is divided into more than one NRD. The Platte River, Elkhorn River, Republican River, and Blue River watersheds all include more than one NRD.

Water table is the upper level of a saturated formation where the water is at atmospheric pressure. The water table is the upper surface of an unconfined aquifer.

For more information on the water quality and quantity in your area contact your Natural Resources District or Cooperative Extension Office. The following publications also may be helpful:

Cooperative Extension

G89-907	Water Testing Laboratories
G90-989	Drinking Water: Bacteria
G93-1128-A	Understanding Groundwater
EC91-735	The Impact of Nitrogen and Irrigation Management and Vadose Zone Conditions on Groundwater Contamination by Nitrate-Nitrogen
EC90-2502	Perspectives on Nitrates
G92-1079-A	Home Water Treatment Equipment: An Overview
G89-946	Water Treatment Equipment: Water Softeners
G90-976	Water Treatment Equipment: A Buyer's Guide
NF91-49	Well Water, Nitrates and the "Blue Baby" Syndrome Methemoglobinemia

Conservation and Survey Division

Water Supply Series	Groundwater-Level Changes in Nebraska
Resource Atlas #4	The Groundwater Atlas of Nebraska
Resource Atlas #3	Groundwater Quality Atlas of Nebraska

UNL Water Center

WC-1	Occurrence of Pesticides and Nitrate in Nebraska's Ground Water
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