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Glossary

aquifer A permeable formation, group of formations, or part of a formation capable of storing and transmitting sufficient quantities of water under normal hydraulic gradients to cause changes in the pressure head or watertable level in a short period. An aquifer is confined if the upper and lower boundaries to the saturated permeable material are essentially impervious. In an unconfined aquifer partly filled with water, the watertable defines the upper water level. A perched aquifer, the upper surface of which is called a perched watertable, is an unconfined groundwater body supported by a small impermeable or slowly permeable unit. In a semiconfined (or leaky) aquifer, the confining layers are slowly permeable in a vertical direction. In a semi-unconfined aquifer, the confining layers are sufficiently permeable for horizontal flow to occur in the confining layer in addition to vertical water flow.

base flow Flow of water in a stream or river derived from groundwater seepage or throughflow into the watercourse. Base flow varies from a minor proportion of stream flow during high runoff periods to a major proportion of stream flow during dry periods.

capillary fringe Portion of the saturated zone immediately above the watertable into which water is drawn as a result of capillary action (movement of soil moisture through fine soil as the result of surface tension forces between the water and individual soil particles). In this zone, the porosity is saturated and the pressure head is less than atmospheric.

catchment Area of a landscape from which a surface watercourse or groundwater system derives its water. Catchments are generally separated by 'no flow' divides associated with high topography.

Cation Exchange Capacity (CEC) In the presence of water, an amount of cations on the surface layers of clay minerals will be easily exchanged with other cations when these are available in solution, hence the term 'exchangeable' cations. Expressed in milliequivalents per 100 grams of dry clay.

CCR Ratio of the CEC to clay content of a soil. Provides a surrogate measure of clay mineralogy and used to define co-efficients in the SALF model. Units are molec/kg. As a guide:

< 0.20	kaolinite
0.20-0.35	kaolinite and illite
0.35-0.55	mixed mineralogy
0.55-0.75	mixed mineralogy with a high proportion of montmorillonite
0.75-0.95	dominantly montmorillonite
> 0.95	montmorillonite plus feldspars and/or CEC from other than the clay fraction.

class A pan evaporation The evaporation of water from a standard class A evaporation pan, expressed as mm/d.

clay minerals Secondary crystalline minerals produced by rock weathering. Clay minerals determine characteristic soil behaviour in terms of ion exchange, water holding, swelling and shrinking, and soil texture. Clay minerals differ according to ion substitution in the silicate layer lattice structure. The three most common types are the kaolinite group (two layer silicates with low CEC), the illite group (three layer silicates with low to moderate CEC) and the montmorillonite (smectite) group (three layer silicates with high CEC that swell and shrink on wetting and drying).

discharge area Area in the landscape where the net movement of groundwater is out of the catchment. Waterlogging and salting are most likely to occur in this area, as expressions of groundwater discharging at the soil surface by seepage or evaporation.

dispersion Process whereby clay particles are repelled by electrostatic forces and mechanical forces (such as swelling) and separate from each other, forming a suspension of clay particles in water. Dispersion is facilitated by high levels of exchangeable sodium, low salt content, and energy input (such as raindrop impact, water flow, cultivation). (The converse process is flocculation.)

drainable porosity Capacity of a soil to hold water between saturation point and the point where water ceases to drain readily from the soil (field capacity), usually expressed as depth (mm).

dryland Not under irrigation.

electrical conductivity (EC) See salinity.

evapotranspiration Water lost as vapour from a vegetated area by direct evaporation of free water as well as transpiration of water by the vegetation. The combined term is used because in practice it is difficult to distinguish between the contributions of these two paths of water loss.

exchangeable sodium percentage (ESP) Commonly used as a measure of soil sodicity, ESP is the proportion of sodium adsorbed on the clay mineral surfaces as a proportion of total cation exchange capacity, expressed as a percentage.

field capacity Soil water content at the point when water ceases to drain readily from the soil, expressed as weight/weight. Heavy clay soils do not have a discrete point at which field capacity is achieved.

flocculation Process whereby the attractive forces between clay particles are greater than the repulsive forces, resulting in the formation of larger aggregates of clay particles. (The converse process is dispersion.)

gleyed soil A soil developed under poor drainage conditions, characterised by reduced (lack of oxygen) conditions and the reduction of metal oxides to their metallic forms. Gleyed soils have a gley (greyish, bluish, or greenish coloured) mottle.

groundwater Water occurring below the surface of the landscape, at greater pressure than atmospheric, occupying cavities and spaces in regolith and bedrock. The upper surface of the groundwater is the watertable.

groundwater discharge Removal of water from the saturated zone. Water exits the groundwater by surface seepage, subsurface outflow, base flow in streams, evaporation and evapotranspiration.

groundwater recharge Water entering the groundwater from the saturated zone immediately above the watertable.

halophyte A terrestrial plant adapted morphologically and/or physiologically to grow in saline conditions.

hydraulic conductivity The potential of a material to transmit fluids, expressed as a volume flow rate of water through a unit cross-sectional area of porous medium under the influence of a hydraulic gradient of unity, at a specified temperature. Hydraulic conductivity is measured in units of length/time (commonly m/s or mm/d), and varies with temperature. (Also called permeability.)

hydraulic gradient Ratio of the change in hydraulic head between two points to the horizontal distance between those two points. Maximum flow is usually in the direction of the maximum fall in head per unit of horizontal distance, that is, in the direction of the maximum hydraulic gradient.

hydraulic head Height at which water stands in a piezometer tube or tensiometer connected a point in a particular subsurface layer, measured relative to a chosen elevation datum. Hydraulic head, expressed in metres, is the sum of three components: the elevation head, defined with reference to the chosen datum (hz); the pressure head, defined with reference to atmospheric pressure (hp); and the velocity head (hv). Water invariably flows from points of higher hydraulic head to points of lower head down the hydraulic gradient. See also potentiometric surface.

hydrology The study of water movement in various states through the terrestrial and atmospheric environments, including underground water, surface water and rainfall, embracing the concept of a hydrologic cycle. This study involves aspects of soils, geology, oceanography, and meteorology, emphasising the processes and quantities of water flow above the terrestrial surface.

illite See clay minerals.

intake area See recharge area.

irrigation water salting Salinity or sodicity in irrigated soils due to an accumulation of salt or exchangeable sodium contributed by irrigation water.

kaolinite See clay minerals.

landform feature Identifiable part or feature of the land surface that has characteristic form and properties identifiable in the field. In relation to salinity, a natural landform or artificial landscape feature that controls water movement in such a way that portions of the landscape, called potential discharge areas, are at risk of salting if groundwater recharge exceeds groundwater outflow.

leaching Removal of soluble materials in solution by water moving through a soil.

macropores Naturally occurring continuous pores of greater diameter than normal soil matrix pore spaces. Macropores can readily conduct water when a soil is saturated.

maximum field water content Maximum water content of a soil two to three days after wetting, expressed as weight/weight.

montmorillonite See clay minerals.

mottling In soils, spots, blotches or streaks of subdominant colours that differ from the soil matrix colour.

necrotic / necrosis Death of circumscribed pieces of tissue, such as patches on leaves. In plants, necrosis is an indicator of disease or plant stress that can be caused by salinity, wind, or high concentrations of specific ions in the soil solution.

perched watertable Upper surface of a localised unconfined aquifer separated from the underlying groundwater by an unsaturated zone.

piezometer A tube, open to water flow at a determined depth, sealed along the rest of its length, and open to the atmosphere at the top, in which the hydraulic head or elevation of the watertable can be measured at a specified point in the groundwater. Technically, this measure of hydraulic head is only accurate under no-flow conditions, but groundwater flow is usually slow enough for the measurement to be reasonably accurate.

plant available water capacity Amount of soil water stored between the field measured upper wet profile (approximating 'field capacity') and the dry profile (approximating 'wilting point') of a soil to the depth of the active root zone. Usually expressed as an equivalent depth of rainfall (mm).

plant salt tolerance Measure of the tolerance of a plant species to saline conditions, usually expressed as yield relative to non-saline conditions.

pores Voids in soil surrounded by soil materials and created by the packing of mineral and organic particles. Pores can be filled by any ratio of air and water.

pore space The total continuous and interconnecting void space in a soil.

porosity Percentage of the total bulk volume of a material or soil that is occupied by void or pore space, measured either as total pore space (absolute porosity) or as interconnected pore space capable of conducting fluids (effective porosity).

potentiometric surface Hypothetical surface, defined by hydraulic head in an aquifer and mapped from observations at piezometers or observation boreholes, indicating directions of groundwater flow in the aquifer. The slope of the potentiometric surface defines the hydraulic gradient and the horizontal direction of groundwater flow. This concept is strictly only applicable to systems where horizontal flow is much greater than vertical flow.

recharge area Area in the landscape where the net movement of water is downwards into and 'recharging' the groundwater. (Also sometimes referred to as an intake area.)

root zone Depth of the upper soil in which the majority of rooting activity occurs. Commonly down to 1200 mm.

saline See salinity.

saline soil A soil containing sufficient concentrations of soluble salts within the soil profile to result in reduced plant productivity or plant death. Climate, soil type, depth to salinity in the soil and plant species influence the effect on plant productivity.

saline water A water containing sufficient concentrations of soluble salts to limit plant productivity under certain environmental and management conditions or to otherwise limit the potential uses of the water.

salinisation The process of salts accumulating in soils or waters. (Also called salting.)

salinity The presence of soluble salts in or on soils or in waters. High levels of soluble salts may result in reduced plant productivity or plant death and may limit its suitability for various purposes. The salinity of a water, soil water extract or suspension is usually described by one or more of four expressions:

- Electrical Conductivity (EC) is a measurement of the quantity of electricity transferred across a unit area per unit potential gradient per unit time at a specified temperature. It is the reciprocal of electrical resistance, and increases with salt concentration. Units are Siemens per unit length (standard unit is dS/m). For soils, the common measurements are on 1:5 soil water suspension and soil saturation extract.
- Total Dissolved Ions (TDI) is the sum of the analysed cations plus anions expressed as mass per unit volume at a specified temperature. The ions in the summation must include at least Ca^{2+} , Mg^{2+} , Na^+ , CO_3^{2-} , HCO_3^- , SO_4^{2-} and Cl^- . (This measure is equivalent to Total Soluble Salts—TSS).
- Total Dissolved Solids (calculated) (TDS calc) is total silica plus the sum of the cations and anions minus $[\text{HCO}_3^- \times 0.5083]$ expressed as mass per unit volume at a specified temperature. The ions in the summation must include at least Ca^{2+} , Mg^{2+} , Na^+ , CO_3^{2-} , HCO_3^- , SO_4^{2-} and Cl^- . The bicarbonate correction allows for the conversion of HCO_3^- to CO_3^{2-} on evaporation. (This measure approximates TDS by evaporation.)
- Total Dissolved Solids (evaporation) (TDS evap) is the weight of material remaining after evaporation of the sample filtrate and drying to a constant weight at a specified temperature, expressed as mass per unit volume.

The temperature of any measurement should be stated. The accepted standard temperature in Australia is 25°C. Conversion of EC measurements to standard or other temperatures (for soils and waters generally) is described in Wells (1978).

salt flat Saline area associated with a shallow or seasonally shallow saline watertable sufficiently close to the soil surface to cause concentration of salts in the root zone or on the soil surface.

salt marsh A coastal area periodically inundated with sea water, or area where a saline watertable occurs at or near ground level, supporting characteristic salt-adapted vegetation.

salt pan Saline area associated with a permanent or seasonal seepage of saline water, or an area where the watertable is seasonally or permanently at ground level.

salt scald An area, bare of vegetation, where erosion of the surface soil has exposed a saline or sodic subsoil. See also scald.

salting See salinisation.

saturation extract An extract of the soil solution made at soil saturation water content.

saturation water content Water content of a soil at which the soil contains the maximum amount of water it can hold when all pore spaces are filled with water.

scald Area where erosion of surface soil has exposed subsoils that remain bare of vegetation. Scalds can be saline or non-saline, sodic or non-sodic.

seedbed Surface layer of soil which has been prepared to promote the germination of seeds and the growth of seedlings.

seepage salting A form of watertable salting occurring when water seeps, seasonally or permanently, at the soil surface, causing salinity either directly or by evaporative concentration. (Non-saline seepages without salting can also occur.)

sodic soil Soil with a high percentage of sodium ions (in soluble or exchangeable form), exhibiting degraded soil behaviour such as dispersion when wet and crusting when dry.

sodicity The presence of a high proportion of sodium ions relative to other cations in a water or soil (in exchangeable and/or soluble form).

Sodium Adsorption Ratio (SAR) Relative content of sodium to calcium and magnesium in a soil solution or water that approximates the ESP of the soil. The relationship between SAR and ESP is based on the Gapon ion exchange relationships.

soil strength Measure of the capacity of a soil to withstand stresses without collapsing or becoming deformed. Consequence of lack of structure in dispersed (sodic) soils. Soil strength can prevent root penetration.

solodic soil Leached, formerly saline soil, associated with semiarid tropical environments, in which the A horizon has become slightly acid and the B horizon is enriched with sodium-saturated clay.

solonetz Dark coloured soil formed from a solonchak (light coloured soil with high concentrations of soluble salts such as sodium sulfate and sodium chloride) by leaching of some of the sodium. Solonetz soils are highly alkaline and develop a columnar structure when dry. Occurring in semiarid, tropical environments, a solonetz soil profile will have a sandy, acid A horizon with a B horizon partially enriched with sodium clay.

standing water level See watertable.

subsurface outflow Groundwater exiting a catchment as subsurface flow.

Total Dissolved Ions See salinity.

Total Dissolved Solids See salinity.

Total Soluble Salts See salinity.

transmission area Area in a catchment where the net movement of water in the groundwater is lateral (approximately parallel to the soil surface) rather than vertical.

transmissivity Rate at which water can be conducted through a unit width of aquifer under a unit hydraulic gradient (units are $\text{m}^3/\text{day}/\text{m}$).

transpiration See evapotranspiration.

watertable Upper surface of a zone of saturation in an unconfined aquifer, which will be at atmospheric pressure. Below the watertable, the aquifer material is permanently saturated; above the watertable, the rock or soil is unsaturated. The 'depth' of the watertable is measured relative to the soil surface as standing water level (SWL). The watertable is also referred to as the phreatic surface, and below the watertable is the phreatic zone.

watertable salting Salinity that occurs where a shallow or seasonally shallow watertable is sufficiently close to the soil surface for groundwater to move upwards to the soil surface by capillary action or seepage, resulting in the evaporative accumulation of salts in the root zone or on the soil surface. Watertable salting does not necessarily involve saline groundwater.

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