

General Water Quality Terms

Water Chemistry: Six major ions make up the dissolved material in water. The major cations in water are generally calcium, magnesium and sodium. The major anions are sulfate, chloride and bicarbonate. Other ions that can be presented in lesser amounts are potassium, iron and nitrate.

Salt Level: The total concentration of salt in water is measured by the electrical conductivity (E.C.) of the water. The units of our E.C. measurement is millimhos per centimeter (mmhos/cm). Another term for this unit of measure is decisiemens. Another term for the total concentration of salt in water is total dissolved solids (TDS). The TDS level of water is generally reported in parts per million (ppm). A quick way to estimate the TDS level of a water sample is to multiply the E.C. by 640. A typical range of E.C. in well water in the upper Midwest is 1.00 to 2.50 mmhos/cm. High quality irrigation water has an E.C. less than 0.25 mmhos/cm. Water with an E.C. over 2.25 mmhos/cm is not recommended for irrigation in the upper Midwest

Hardness: Water hardness is caused by calcium and magnesium. AGVISE reports hardness in milligram per liter equivalent to calcium carbonate (mg /l CaCO₃). Another unit often used in the water softener industry to measure hardness is grains per gallon. To convert an AGVISE hardness reading to grains, divide the AGVISE reading by 17.1. For household use, ideal hardness is less than 100 mg/l CaCO₃ or about 6 grains.

SAR: The Sodium Adsorption Ratio (SAR) of a water sample is the proportion of sodium relative to calcium and magnesium. The SAR has no units associated with it. Water with a SAR value over 6 should not be used for continuous irrigation on most soils.

Nitrate-Nitrogen: Nitrate-nitrogen levels exceeding 10 ppm of NO₃-N are a health concern for humans. High nitrate levels are also a concern for livestock that may drink the water. To check a water sample for drinking purposes, a certified laboratory must test other parameters such as coliform bacteria.

pH: pH is a measure of the hydrogen ion concentration in water. The pH of water indicates whether the water is acid or alkaline.

Sulfate Sulfur: Sulfates are a combination of sulfur and oxygen and are a part of naturally occurring minerals in some soil and rock formations that contain groundwater. The mineral dissolves over time and is released into groundwater. Sulfate may have a laxative effect that can lead to dehydration and is of special concern for infants. With time, people and young livestock will become acclimated to the sulfate and the symptoms disappear. Sulfur-oxidizing bacteria pose no known human health risk. The desirable sulfate sulfur level is less than 85 ppm of sulfate sulfur (250 ppm if reported as sulfate).

Chloride: Small amounts of chlorides are required for normal cell functions in plant and animal life. Chlorides are not usually harmful to people. The public drinking water standards require chloride levels not to exceed 250 ppm. Some plant species under sprinkler irrigate will show burn injury at about 175 ppm of chloride.

Salinity (Salt Level) in regards to irrigation

C1 - Low salinity water-- (Conductivity < 0.25) -- can be used for irrigation with most crops on most soils with little likelihood that soil salinity will develop. Some leaching is required, but this occurs under normal irrigation practices except in soils of slow and very slow permeability.

C2 - Medium salinity water-- (Conductivity 0.25 to 0.75)-- can be used if a moderate amount of leaching occurs. In most cases plants with moderate salt tolerance can be grown without special practices for salinity control.

C3 - High salinity water--(Conductivity 0.75 to 2.25) cannot be used on soils with moderately slow to very slow permeability. Even with adequate permeability, special management for salinity control may be required and plants with good salt tolerance should be selected.

C4 - Very high salinity water --(Conductivity > 2.25)-- is not suitable for irrigation under ordinary conditions, but may be used occasionally under very special circumstances. The soils must have rapid permeability, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching, and very salt tolerant crops should be selected.