Irrigation Water Guidelines

Interpretation of water quality for irrigation purposes is crop-specific. Crops differ in their salt tolerance and respond differently to the quality of water with which they are irrigated. Use the following information as a guideline to determine if a possible problem exists.

The primary items of interest in your water analysis are total salts (Total Dissolved Solids), Sodium, Chloride and Sodium Adsorption Ratio (a calculation using the ratio of calcium plus magnesium to sodium). These are the main items that determine the suitability of water for irrigation. As noted above, different crops have different tolerance of salts. The following table lists the salt tolerance of some of the major crops in Oklahoma and Texas.

Relative Tolerance of Crops to Salt

Highly Tolerant	Moderately Tolerant	Moderately Sensitive	Very Sensitive
Cotton, wheatgrass bermudagrass	Wheat, soybeans, sorghum, fescue, broccoli, tomatoes, cucumbers, cantaloupes	Corn, alfalfa, clovers, cowpeas, lettuce, peaches, apples, pears, grapes, blackberries	Field beans, carrots, onions, strawberries,

The following table shows the suitability of water for irrigation based on the total dissolved salt level.

Suitability of water for irrigation based on Total Dissolved Salts

Very Low	**Low**	**Medium**	**High**	**Very High**
0-300 ppm	301-600 ppm	601-1000 ppm	1001 – 1500 ppm	>1500 ppm
Suitable for all crops	Suitable for all except extremely sensitive crops	Suitable for moderately tolerant crops and for moderately sensitive crops if special precautions are taken	Suitable for moderately tolerant and highly tolerant crops	Suitable only for highly tolerant crops and then only with special precautions

These tables do not cover every eventuality. For example, you can use water with high levels of salts on sensitive crops if you apply small amounts very infrequently. Also, you can use high salt water on crops if you get a lot of rainfall to leach the salts away. The tables are a general guideline to use to determine the long term effects of irrigating with water with different levels of salts.

The following tests have been conducted on your water sample: pH, Sodium Adsorption Ratio (SAR), Total Dissolved Solids (TDS), Electrical Conductivity, Cations/Anions, Sodium, Potassium, Calcium, Magnesium, Total Hardness, Nitrate, Sulfate, Chloride, Carbonate, Bicarbonate, Total Alkalinity and Boron. Following is a brief explanation of each test.

Water pH – a measurement which determines the level of acidity or alkalinity of the water. Most water samples have a pH greater than 7.0. Acidic water (<6) could cause corrosion of metal parts in irrigation equipment.

Total Dissolved Solids (TDS) – related to the amount of dissolved salts in the water. Higher salinity results in higher electrical conductivity. As the salt level increases, the plant must expend more energy to take in nutrients dissolved in the water from fertilizer and the soil. Some plants are very sensitive to salinity, while others can tolerate a wide range. TDS is calculated from the **Electrical Conductivity**, which is the analytical test used to determine salt concentration.

Sodium – a cation element contained in water. High sodium levels are bad for irrigation water quality because sodium is a component of a harmful salt and also causes poor physical conditions of soils. It is the main component of soft water.

Potassium – a cation element and one of the fertilizer elements and a component of total salts. It is not of consequence in irrigation water unless it occurs in extremely high concentrations.

Calcium and Magnesium – cation elements in water that are major components of hard water.

Nitrate – an anion element that can cause problems in high concentration in drinking water, but not in irrigation water. High nitrates in irrigation water provide nutrients to the crop.

Sulfate – an anion element that can combine with calcium and form gypsum. It can also cause a foul odor and taste if high concentrations exist. It is not usually a major concern in irrigation water.

Chloride – an anion element that can be very damaging to plants in high concentrations. This is especially true when it is accompanied by high concentration of sodium.

Carbonate and Bicarbonate - direct measures of the liming potential of the water. For many crops, use of water with an appreciable liming potential is not of concern and may lower the need for agricultural lime additions. However, some crops such as pecans can be adversely affected as increasing the pH will make micronutrients such as zinc less available.

Boron – an anion element that is usually not a problem in most crops. High concentrations (>1.0 ppm) can cause problems in pecans and peanuts.