

# Texas Plant & Soil Lab, Inc.

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## WATER ANALYSIS GUIDE SHEET

The quality of well water varies greatly especially in the RG Valley, Mexico & all of Texas. Good quality water may be used extensively. Very poor water should never be used. There are many types of water, which may be used in a restricted manner during an emergency and with proper treatments. As such, they may be valuable.

In order to use water for greater benefit, essential characteristics must be known, to reduce damage to land and crops. TSS composition is important for proper management: CATIONS of Na, Ca, Mg, K and ANIONS of Cl, HCO<sub>3</sub>, SO<sub>4</sub> and B.

Important characteristics and their meanings are given below:

### TOTAL SOLUBLE SALTS:

Electrical Conductivity (E.C.) measures the total soluble (dissolved) salts (TSS) as umhos/cm, ( 1.0 E.C. = 640 ppm ).

PPM = parts of a salt per million parts of water  
(10,000 ppm = 1%. Sea Water contains about 3% salt.)

0 - 299	Very Low	Should be no problem
300 - 699	Low	Seldom of any concern
700 - 999	Medium	SAR rating is best guide
1000 - 1199	Moderately High	Use good water & soil management
1200 - 1499	High	Water & Soil management necessary
1500 - 1799	Very High	Emergency use - requires soil treatment
> 1800	Extremely High	Maybe Very harmful to soil & plants with repeated use. Treat water & soil.

The above table gives an average idea on water quality. Below are other factors, which must be considered in making practical decisions:

1. How much salt is in the soil to begin with ? (Soil salt checks that identify Soluble Salts are important when mediocre waters are used)
  2. What is the soil type ? (Drainability is extremely important.)
  3. What is the rainfall between irrigation's ? (With good internal drainage, salts can be washed below the root zone.)
  4. What is the method of application ? (Pan, row, drip or sprinkler)
  5. How salt-tolerant is the crop ?
- ◆ **Highly Salt Tolerant:** (> 4.0 E.C) Bermudagrass, Beets, Spinach, Many Cotton varieties, Barley, Asparagus, Date Palm.
  - ◆ **Medium Salt Tolerant:** (2.0 - 4.0 E.C) Alfalfa, Tomatoes, Broccoli, Cabbage, Celery, Peppers, Lettuce, Corn, Oats, Grain Sorghum, Potatoes, Sugar Cane, Squash, Cucumbers, Watermelons, Soybeans, Grapes, Radish.
  - ◆ **Sensitive to Salts:** (< 2.0 E.C) Citrus, Berries, Avocado, Apples, Beans, Carrots, Onions, Peas, Papaya, Peaches, Pears, Plums

Treatments can only aid salt leaching by making chemical changes. Salts must be physically flushed below the root zone. To do this, the soil must be permeable and sufficient water must be applied.

### CHLORIDES & SULFATES

are the most predominate kinds of salts. Chlorides are more harmful. They are highly soluble & move easily with the water. Cl > 300 ppm may burn plants & roots on contact. Some plants may be more tolerant.

**SODIUM** affects the soil in an undesirable manner. It tends to make the soil hard and impermeable, thus the leaching of salts is difficult. Soluble Calcium has the opposite effect. The amount of Sodium that will be absorbed by the soil from the irrigation water depends primarily upon the relationship between Sodium and Soluble Calcium: **SAR - Sodium Adsorption Ratio**. A high SAR requires addition of high amounts of soluble calcium. The need for calcium also depends upon total salts in the water, as well as bicarbonates & sulfates. Soil soluble & extractable calcium must be known also to manage salts properly.

**BICARBONATES & CARBONATES** should be lower than Calcium & Magnesium for the following reasons: As irrigation water moves thru the soil, it becomes more concentrated.

More and more water is lost due to evaporation and absorption by the roots. Calcium Carbonate will precipitate, because it is of low solubility. The excess carbonates left in the water will then combine with the Sodium to form Sodium Carbonate - leading to the formation of **black alkali**. More Soluble Calcium must be added to make up for the precipitated Calcium Carbonate. Considering the various factors determining calcium needs, our soil test recommends the amount of Calcium needed in each case. The most suitable Calcium treatment maybe Gypsum, Sulfur or other materials containing Sulfur. They can liberate calcium from the soil, provided there is a supply of Calcium Carbonate in the soil.

Excessive amounts of **BORON** are toxic to plant growth.

### PLANT BORON EVALUATION TABLE (ppm)

Ratings	Sensitive	Semi-tolerant	Tolerant
<b>Low</b>	below 0.40	below 0.80	below 1.40
<b>Medium</b>	0.40 to 1.00	0.80 to 1.50	1.50 to 2.50
<b>High</b>	1.00 to 1.80	1.50 to 2.80	2.50 to 3.50
<b>Very High</b>	above 1.80	above 2.80	above 3.50

### Boron Sensitive Crops

- ◆ **Sensitive:** Citrus, Avocado, Pecans (accumulates in leaf with age), Beans, Garlic, Onions, Cowpeas, Peanut, S-Potato, Strawberry, Sunflower, Sesame
- ◆ **Semi-tolerant:** Broccoli, Carrots, Cucumber, Pepper, Potato, Cabbage, Celery, Corn, Squash, Cantaloupe, Cauliflower, Radish, Turnip
- ◆ **Tolerant:** Tomato, Alfalfa, Parsley, Beets, Cotton, Sorghum, Asparagus

**BORON** may be leached from the soil. Good tilth (condition/structure) from humus and soluble Calcium in the soil is essential to aid the leaching of all salts. Chemical treatment and physical flushing aids leaching.

### TOTAL SOLUBLE SALTS for animals should not exceed:

- ⇒ 3,000 PPM ----- Poultry      7,000 PPM ----- Dairy Cattle
- ⇒ 8,400 PPM ----- Horses      10,000 PPM ----- Beef Cattle
- ⇒ 12,000 PPM ----- Sheep

When no other water is available and cattle are forced to a certain water supply, they may adjust to 10,000 to 15,000 PPM of Total Soluble Salts (depending upon composition). Older cattle can take more salts than younger cattle.

**NITRATES** NO<sub>3</sub> are toxic to Infants above 10 ppm -- Humans 15 ppm -- Cattle if found in amounts above 45 ppm.

### DRINKING WATER FOR HUMANS (POTABLE):

should be tested for bacteria. One Lab available for bacterial analysis. (Allergy & Indoor Air Quality Lab - 711 Nolana Suite 102-C - McAllen, TX 78504      Phone (956) 687-3534)

### SOIL & WATER MANAGEMENT

**WATER** When watering, soak deeply but as infrequently as possible. Light watering tends to speed salt build up. Heavy clay soils may need some light watering when subsoil's are wet, but should get deep soaking to leach salts when possible, avoid water logging the plant root zone.

**SOIL** Maintain high soluble calcium for improved soil condition (structure) to aid air, water & root penetration. Use soil test that determines soluble Calcium to determine best and most economical treatment. Organic Matter (humus) & soil inoculants also aid soil tilth (physical condition).