AQUATIC ECOSYSTEMS MANAGEMENT
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Irrigation Water Quality: Total Dissolved Solids

Total Dissolved Solids

All water contains some dissolved mineral salts and chemicals. Some soluble salts are nutrients and are beneficial to grass and other plant growth, others however may be toxic to plants or may become so when present in high concentrations. The rate at which salts accumulate in soil depends on their concentration in the irrigation water, the amount of water applied annually, annual precipitation (rain plus snow), and the soil's physical/chemical characteristics.

Throughout our area many businesses use recycled water for irrigation. Water from retention ponds and/or wells is used for irrigation initially and then the excess water runs off into the pond. With each pass over the landscape the water picks up more dissolved material. Much of the recycled water used for irrigation contains high concentrations of dissolved salts that are potentially toxic to turf grasses and other plants. Water analysis and periodic monitoring are key components of irrigation management at such sites.

Analyses of irrigation water provide data on many parameters. The most important parameters for irrigation purposes are: total suspended solids (salinity); sodium (Na); relative proportion of sodium to calcium (Ca) and magnesium (Mg) (Sodium Adsorption Ratio); chloride (Cl), boron (B), bicarbonate (HCO3), and carbonate (CO3) content; and pH.

Water Reclamation:

Reverse-osmosis water filtration units are the best method of total suspended solids removal. Osmosis is a special case of diffusion in which the molecules are water and the concentration gradient occurs across a semi-permeable membrane. Diffusion is the movement of molecules from a region of higher concentration to a region of lower concentration. The semi-permeable membrane allows the passage of water, but not ions (e.g., Na^{+}, Ca^{2+}, Cl^{-}). Reverse osmosis is very cost-prohibitive. Alternatives to reverse osmosis include precipitation and removal with activated charcoal. Activated charcoal however, will only removed negatively charged ions leaving positively charged ions such as sodium in the water.

Soil Reclamation:

Salts accumulate in soils because insufficient rain falls to purge them from the soil. Soil reclamation involves replacing sodium ions in the soil with calcium. The released sodium ions are then leached deep beyond the root zone by using excess water and finally carried out of the field in the drainage water. The most commonly used method for replacing the sodium ions is by applying large quantities of gypsum (calcium sulfate) to the soil followed by water saturation. The applied gypsum slowly dissolves in the water releasing calcium ions, which replace sodium ions from the soil into the downward moving water. Lime (calcium carbonate) is not used as saline soils are sometimes already high in carbonate salts and are therefore alkaline. The reclaimed soils can become saline again unless appropriate management practices are followed.