TURF TIPS

Reclamation of Saline and Sodic Soils

Saline and sodic soil conditions can be caused by many factors: high salt content in the parent material, poor internal drainage conditions, a high water table carrying salt to the soil surface, and high amounts of salt being applied, usually with poor quality irrigation water. Before a reclamation system can be established, the causal factor must be reduced or eliminated

Drainage

When deciding whether reclamation will be effective, it is important to consider soil drainage conditions. The ability to leach water through the soil profile is dependent upon good internal drainage. In fact, the overall effectiveness of a reclamation system is dependent upon leaching. Leaching carries the salts down through the soil profile and out of the rooting zone. Without it, salts will accumulate regardless of any applied soil amendments.

If natural drainage is low (or poor) then a tile drain should be considered. When properly installed, they are highly effective at carrying away the leached salts. Tile can only drain water if it is placed below the zone of saturation. For installation and or consultation, a professional should be contacted.

Another problem in turf areas is when two different soil types occur in the top foot of soil, inhibiting the downward movement of water. This can happen when top dress sand is applied to native soils (push-up greens) or when two different sand grades are used for top dressing. This creates a "perched" water table. Again, this condition needs to be reduced or eliminated for leaching of salts to occur. Radical deep tine aerafication can help in most cases, but not all. If left uncorrected, "black layer" can occur, causing additional problems, resulting in decreased rooting. A professional should be contacted for consultation.

Leaching and Reclaiming Saline Soils

Saline soils cannot be reclaimed by fertilizers and/or soil amendments. However, they are relatively easy to reclaim if adequate amounts of low-salt irrigation water is available and internal drainage has been established. Reclamation consists of applying enough high-quality water to leach through the soil. Generally, about 6 inches of water are required to remove 70 to 80 percent of salt for each 6 inches of soil.

To ensure salt accumulation does not reoccur, an excess amount of water must be added, so the amount of salt added is equal to the amount of salt leaving the root zone.

Reclaiming Sodic and Saline-Sodic Soils

A sodic soil is one high in sodium. Sodium causes the clay in the soil to disperse, resulting in the loss of soil structure. As a result, internal drainage can be severely decreased. In addition, sodium also increases the soil pH value and adds to the total soil salinity content. A soil amendment is required to re-establish internal drainage and then leaching is required to remove the sodium.

The sodium in the soil needs to be replaced with calcium. Calcium floculates the clay minerals resulting in improved soil structure, which in turn improves internal drainage. Calcium can be supplied by native gypsum (already in the soil), calcium in irrigation water, or with commercial amendments

Table 1. Amendment for soil and water, and their relative effectiveness in supplying calcium.

Amendment	Suitable for	Tons equivalent to one ton of 100% Gypsum
Gypsum	Soil & Water	1.00
Sulfur	Soil	0.19
Sulfuric Acide	Soil & Water	0.61
Ferric Sulfate	Soil	1.09
Lime Sulfur	Soil & Water	0.78
Calcium Chloride	Soil & Water	0.86
Calcium Nitrate	Soil & Water	1.06

In order to reclaim soil to a depth of six inches, gypsum recommendations are as follows: Tons Gypsum/acre = 0.85 * (meq Na/100 g – (CEC * 5%).

If soils contain no source of calcium, then gypsum or a soluble calcium source should be applied. If soils contain lime (calcium carbonate), then acid, or acid-forming materials, should be used. Examples of acid or acid-forming materials include; sulfuric acid, elemental sulfur, ferric sulfate, and lime sulfur. Sulfuric acid reacts immediately with soil lime. One advantage of using sulfuric acid is the gypsum forms very fine particles. The fine gypsum particles react more quickly to replace sodium.

Acid-forming materials (such as sulfur) go through the following steps.

Step ❶ Sulfur + Oxygen + Water ⋯⋯➤ Sulfuric Acid

Step ❷ Sulfuric Acid + Lime ⋯⋯⋯⋯⋯⋯⋯⋯➤ Gypsum + Carbon Dioxide + Water

Step ❸ Gypsum + Sodic Soil ⋯⋯⋯⋯⋯⋯➤ Calcium Soil + Sodium Sulfate

The reclamation process is not complete until most of the sodium is removed from the soil below the rooting depth. Time is required for soils to react and rebuild soil structure. The amount of time is dependent upon the site.

Conclusion

Correcting saline and sodic soils requires salt to be leached out of the soil profile. This requires good quality water, good soil permeability and good internal drainage. Amendments that supply soluble calcium are needed to correct sodic soils.