Saving your field

By Bill Nolde, MS, CPAg

Environmental stresses (heat, wind, cold, mowing, aerification, irrigation, fertilization, and pesticide application) coupled with on-going physiochemical reactions within the soil of sports fields will continually change the soil condition. More often than not these changes are not beneficial. If they were there would be no turf loss and no need to renovate or rebuild a sports field.

Heat, wind, and cold obviously cannot be controlled by the sports turf manager. But the turf manager must be knowledgeable enough about the damage that can be caused by these stresses to be able to reduce or repair the damage they cause. At the very least the turf should be healthy enough to be able to repair itself quickly after it has been damaged.

Mowing (height, duration, mower condition) and aerification (frequency, type of tines) are definitely causes of stress to turfgrass and should be reduced to help prevent adding to turf stress during times of high heat, high wind, and intense cold. Aerification that is commonly recommended to relieve soil compaction can also cause subsurface compaction (i.e., cultivator pan) and damage to rootzones. The benefit of most aerification processes is relatively short-lived

and is hardly worth doing on expansive, high-clay content soils. Subsurface compaction seriously diminishes soil hydraulic conductivity and is one of the main causes of black layer in sports turf.

Fertilizer and pesticide applications can be helpful if the products are applied judiciously. However if over applied, these products can damage turfgrass roots and destroy beneficial microorganism populations. Try to manage your soil to encourage a robust population of beneficial microorganisms. Turfgrass is primarily a bacteria-dominant ecosystem that can effectively combat turfgrass fungal pathogens if the bacteria populations are high enough. There are also strains of beneficial fungi, including micorhyzzae, in turfgrass soil systems. Populations of these beneficial organisms can be increased by an annual topdressing of a good quality compost.

Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC)

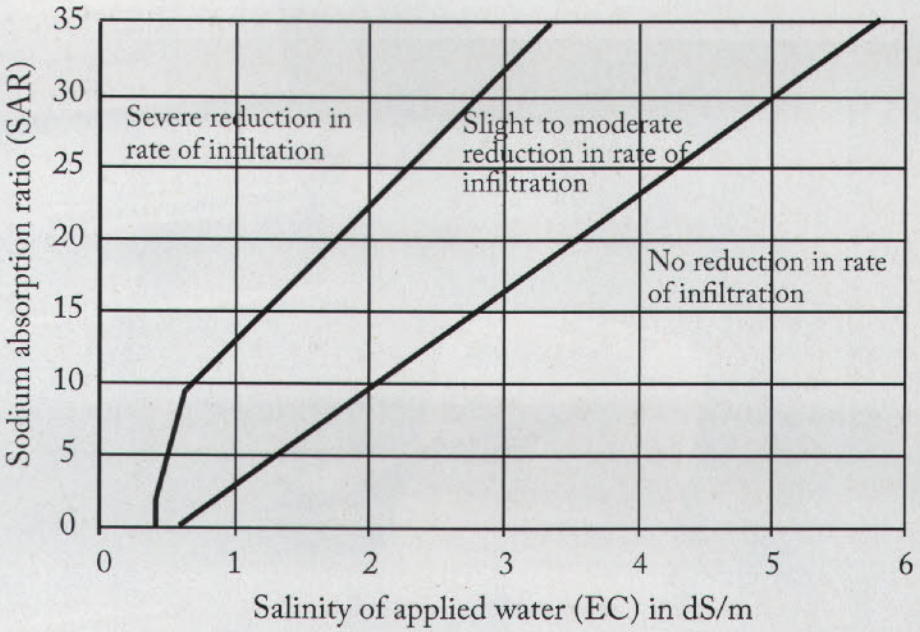
SAR/Salinity Hazard of irrigation water					
If SAR is:	0-3	3-6	6-12	12-20	20-40
and EC (dS/m) is:					
None	>0.7	>1.2	>1.9	>2.9	>5.0
Slight	0.7	1.2	1.9	2.9	5.0
Moderate	0.2	0.3	0.5	1.3	2.9
Severe	<0.2	<0.3	<0.5	<1.3	<2.9

Irrigation water woes

A sports turf manager has practically no control over the quality of his irrigation water. If the irrigation water source is from a holding pond, fine particulates of clay and silt commonly find their way into the growing medium and plug pore spaces, even on a high sand rootzone field. Many sports fields are irrigated with treated effluent water that is very high in sodium and other salts. Even potable water in many states has levels of salts that are high enough to be damaging to turfgrass soils.

Sodium is the one salt in irrigation water that is most damaging to soil structure. There is no physical or chemical way to remove these sodium ions from water. Therefore, their threat to soil structure must be combated after they have entered the soil matrix. Soils with a measurable amount of clay in them are most at risk from sodium absorption onto clay micelle cation exchange sites. When large numbers of monovalent sodium cations (Na+) adsorb onto these sites the physical attraction between micelles is exacerbated. This results in a phenomenon called clay dispersion, which is not good.

As seen in Table 1, for extremely low salinity irrigation water, even low SAR water should be avoided. High salinity water (EC1.50-3.00) with SARs above 4 needs to be carefully managed. It is recommended that once a year the soils should be subject to testing in order to assess possible sodium problems.



Graphs by LennTech

The higher the salinity, the higher the SAR index in order to cause infiltration problems. On the other hand the lower the salinity, the greater the risk of infiltration problems independent of the SAR value.

Rainfall can reduce the soil salinity and consequently

increase the SAR index and reduce water penetration into soils (see Figure 1).

Reversing clay dispersion and causing the clay micelles to repel each other will result in flocculation. Flocculation will result in the reestablishment of soil pore spaces, which in turn, will improve soil hydraulic conductivity. Flocculation will allow water, air, and roots to find their way deeper into the soil. A well flocculated soil needs no mechanical aerification and will eliminate the threat of black layer formation and other diseases. With air in the soil pore spaces aerobic bacteria will become dominant and the environment that would favor turfgrass fungal pathogens will no longer exist.

Flocculation happens after introduction of high levels of divalent calcium cations (Ca++) into the effected soil. Calcium sulfate and calcium chloride, to a greater degree, have been used to do so. Up until now science has not been able to provide sports turf managers with a product that will do all that has been described so far and then keep it that way for a long time. That has, perhaps, changed.

Research from Texas A&M ("Gypsum and Polyacrylamide Soil Amendments Used With High Sodium Wastewater") tested the idea that gypsum applied after disking versus a polyacrylamide (PAM) applied in solution can reduce soil crust formation and improve the infiltration rate of water into soil irrigated with water high in salt and sodium. The results showed that the damaging effects of wastewater irrigation water can be effectively ameliorated using PAM and that it lasted many weeks after the last application of PAM. Gypsum was found to be not as effective as PAM and there was no longevity associated with gypsum.

Another research paper, "Aqueous Polymer Effects on Volumetric Swelling of Na-Montomorillonite (Clay)," was published by researchers at the University of North Carolina in 2005. This research analyzed the effectiveness of three types of products that might flocculate soils and stabilize them after flocculation: sodium carboxymethlycellulose (CMC), polyacrylamide (PAM), and polyethylene oxide (PEO) were tested as stabilization agents against Na-montmorillonite clay upon irrigation application.

Instruments were used to measure the volumetric swelling ratio (VSR), an expression of the clay volume at any time relative to the amount of water it has absorbed and not drained causing swelling. The results showed that PAM reduces the VSR by as much as 40%. Test results for CMC and PEO show that clay swelling is not significantly reduced. This result shows that creation and maintenance of soil pore spaces in clay soil can successfully be accomplished without tilling the soil. The study's conclusion is that PAM can be used as an effective soil stabilization agent for clay soils.

The US Department of Agriculture (USDA) has done extensive research on the use of PAM as an effective material for stabilizing soils in farming. USDA studies have shown that furrow irrigation, soil erosion, water infiltration into soil, and sprinkler irrigation have all been improved by the use of PAM.

Knowing how to properly groom and prepare a sports field for play is what builds a sports turf manager's reputation among his peers. Generally speaking, his employer expects him to know how to do that. What solidifies a sports turf manager's reputation in the mind of his employer is his problem-solving skills. If you can turn around a sports field in decline and make it a showplace again, your job will be secure and you will take great pleasure in such an accomplishment. It is hoped that science can deliver to you here a nugget of knowledge that you can put to use to salvage a problem field you might have or prevent a field from ever becoming a problem.

There are only a few non-agricultural sources of water soluble polyacrylamide, the type used in the research studies, at this time. They can be bought and shipped to you with good instructions on how to use them. One product is Soil Drain that can be reviewed at www.bettertopsoils.com or the product Remedi-Cal Plus at www.soillogic.com. ■

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