# Is your turf under "a-salt"?

**SPORTS FIELDS** are constantly under attack! Insects, diseases, weeds, and shrinking budgets are your enemies. At least these enemies are visible. Yet there may be other enemies lurking about: being assaulted with salts is becoming more common. No worries! By the end of this article you will have your own arsenal to defend your turf.

Hey you...yes you! Don't assume the "coast is clear" and this issue pertains only to places near the ocean. There are other ways salts sneak into your fields. So read on!

## WHERE SALTS COME FROM

Yes, coastal areas see the greatest impacts from salt spray and/or irrigating with tidally influenced rivers, lakes and other surface waters. But salt problems are not limited to coastal areas. Other conditions where salts may be problematic include:

- Turfgrasses irrigated from naturally occurring saline aquifers.
- Excessive removal of water from shallow freshwater aquifers can result in them being contaminated by saline water from underlying aquifers.
- Irrigating with treated waste water; many times, salts are used as part of the treatment process.
- Arid regions where salts concentrate in soils as water is lost through evapotranspiration and not replaced through rainfall or adequate irrigation.
- Areas in droughts or dense populations where water conservation efforts result in constant water restrictions that limit irrigation.
- Many deicers and snow melt chemicals are salt based. The salts are lost with water runoff. If that water is shunted to an irrigation pond, the pond water can become salinized.

Now do I have your attention?

## ATTACKS ON SOIL STRUCTURE: not all salts are created equal

There are many different salts out there: calcium chloride, potassium chloride, sodium chloride, magnesium sulfate, sodium bicarbonate just to name a few. Having many different salts present does not do much harm for your soil structure. Those divalent cations (2+ charges) magnesium ($Mg^{2+}$) and calcium ($Ca^{2+}$) act as bridges between the cation exchange sites on soil particles. This results in aggregating the soil and promoting good air and water movement.

And then there is sodium ($Na^{+}$). Sodium is a monovalent cation (one + charge), and thus it does not act as a bridge between soil particles. Instead Na fills each exchange site. In addition, Na is a very hydrous ion; it likes a lot of water. You can think of it as a very "bulky" ion and in being so, it pushes soil particles away from each other. This is called soil dispersion. When Na disperses soil particles there are little to no aggregates. Individual soil particles lay close together and the soil is susceptible to compaction resulting in very few pores for water and air movement. Water can no longer easily penetrate and move throughout the soil profile. Roots also have a hard time growing.

The degree of problems increases with the cation exchange capacity (CEC) of your soil. Since CEC is related to soil texture, knowing what your grass is growing on will help you quickly assess damage potential. Finer textured soils and soils with organic matter will have greater CEC than medium to coarse sand soils. Thus soil structure problems will be less in sandy soils.

## PLANT TORTURE: salt induced battle scars

Under typical soil moisture conditions, plants have to overcome one major obstacle to take up water: the tension of water being held to soil particle surfaces. This is called matric tension. Plants must overcome another battle when salts are present, called osmotic tension. Think of this as the battle over water. Salts like water too and thus plants must work harder and exert more energy to battle the salts to take up the water. If too many salts are present, plants cannot take up enough water and begin to stress and wilt.

If Na disperses soil aggregates and ruins soil structure, turfgrasses may become water stressed because water is never getting to the rootzone. Rather water from irrigation and rainfall is lost to runoff or evaporation from the surface.

In addition, as water is taken up from soil solution by the plant, some solutes are taken up as well. In concentrated amounts, toxicities can occur. Some turfgrasses have ways to deal with increased salts. For example, bermudagrass has salt excretion glands at the base of their blades. In general, warm-season grasses tend to be more salt tolerant than cool-season grasses. Grasses vary greatly in their tolerance to specific solutes. Besides root uptake, overhead irrigation with saline water may directly burn foliage. In both cases of direct injury, the plant may become stressed as it uses energy to repair tissue rather than for daily metabolic processes.

## KNOWING IS HALF THE BATTLE

Any good attack starts with knowing your enemy. Get your irrigation water source analyzed. Make sure the test report includes Na, Cl, Mg, Ca, Electrical conductivity (EC), soil absorption ratio (SAR), and residual sodium carbonates (RSC). Your lab should be able to help you interpret the results. If you have a saline and or sodium problem, you will need to also take soil samples to assess current soil conditions to determine which management practices you will need to take.

Management typically includes many of the following:

- Aerifying to break up any salt crusts that may form.
- Topdressing with coarse sand to improve water and air movement.
- Ensuring the drainage system is adequate.
- Leaching the soil with every irrigation by applying a leaching requirement (LR) if the soil salt status is to be maintained at its current level, or a reclamation factor if soil salt concentrations need to be lowered.
- Applying an amendment directly to the soil or injected into the irrigation system to knock Na off the cation exchange sites and leach it pass the rootzone. Amendments typically used are high in Ca and or Mg (a common amendment is gypsum). For soils that contain a lot of calcium carbonate (free lime), sulfuric acid is commonly used to release the Ca to replace the Na. There are also other soil conditioners that assist in sodium removal. If you are considering using one, make sure you ask to see the research documenting its effectiveness. ■

*Dara M. Park, Ph.D. is an aassistant professor, turfgrass, soil & water quality at Clemson University.*