Water-saving tips for sports fields

Editor's note: *The author is Rain Bird's area specification manager for the Southeast region.*

THERE ARE MANY WAYS that sports turf managers can save water while still keeping their fields in top condition. Some of the tips I offer relate to system design. If the right product isn't specified for the right application, or at the manufacturer's recommended spacing and pressure, the system may use too much water. Other tips involve regularly evaluating system performance and then making any necessary changes to improve performance moving forward.

DESIGN TIPS

• Use a variable frequency drive (VFD) pump. VFD pumps adjust pump motor speed based on the demand of the irrigation zones that are running. Not only can this save water, but will also save on electricity.

• Pay strict attention to zoning the irrigation system (how the system is sectioned or divided) for these reasons:

• Fields with specific areas that incur heavier use should be zoned accordingly. For example, the centers of football, soccer or lacrosse fields typically endure more wear and tear. When it's time to re-seed or re-sod these areas, having them on a separate zone allows you to water them as needed and eliminates unnecessary watering of the perimeter.

• Sunny and shady areas should be zoned separately so you can apply more or less water to each respective area. If there are sunny areas combined with shady areas in the same zone, many sports turf managers will water according to the needs of the sunny areas, which then results in over-watering the shaded ones.

• Low-lying areas should also be zoned separately to minimize or eliminate run-off that can create boggy conditions in those areas.

Large area sprinklers as water conservation devices

By Phil Robisch CLIA, CID, CWCM-L, LEED AP

Editor's note: The author is Product Technical Resource Manager, Hunter Industries Inc.

QUITE OFTEN people will see large expanses of turf in parks and on athletic fields, and think of how wasteful they are in regard to water. That perception is increased when they see the irrigation system running, and spraying large amounts of water into the air. What they don't understand is that those lush, green turf areas are more than just important recreational sites, they are air purifiers, contaminant filters, oxygen producers, air conditioners, and carbon sinks. They also provide us with pleasing green space, so important to human happiness, and help to offset the effects of hardscapes and buildings in our urban environment.

What about the water they use? Yes, water is needed to keep these surfaces in top shape, but the water used is for a good cause, as evidenced by the paragraph above. Everyone agrees that we need to clean our air, sequester carbon, offset the heat we create when we develop land, and provide safe play surfaces, and sports turf does all these things extremely well. The perception of some is their reality, and that is water is being wasted. But is it true? Professionally managed, well-maintained sports turf, watered by a professionally designed, installed, and maintained irrigation system actually uses water very efficiently, and that is what we will explore here.

Perception: Large rotors spraying great amounts of water are inefficient.

Fact: Manufacturers of sports turf sprinklers spend huge amounts of engineering, testing, and development time, and money to produce emission devices that rate in the excellent category as far as irrigation efficiency, as defined by the Irrigation Association. A properly designed and installed irrigation system operating at the appropriate pressure distributes water with a high degree of **uniformity**, ensuring the system only needs to run for the optimum amount of time to provide adequate water. Inefficient sprinklers that do a poor job of applying water must run for extended time to make sure the driest area receives enough water to keep it green, while wetter areas are overwatered—sometimes by more than twice what they need. Concerning the large amounts of water coming out of the sprinkler, just remember, they are covering a greater amount of area when compared to spray sprinklers as well.

Perception: Large rotors operate for long periods of time compared to spray sprinklers, and that wastes water.

Fact: Large rotors do run for much longer times than typical spray sprinklers, and they need to. Small area spray sprinklers apply water at a high application rate, generally around 1.5 inches per hour. Some are much higher than that as well, but just imagine a rain storm that measured 1.5 inches in one hour; that's a lot of rain, at a rapid pace. Spray sprinklers by their nature apply a lot of water quickly, and only need to run for a short time to get the job done. Large rotors by comparison apply water at very slow rates, normally in the range of .5 inches per hour, one third the rate of sprays. They do need to run three times longer than spray sprinklers to apply the same amount of water to an area, but they do it with greater efficiency. Not only is their distribution of water superior to spray sprinklers, but the lower application rate ensures more of the water is absorbed by the soil, and is available for the plants. Soils in general cannot accept water at high rates, so some of the water applied by spray sprinklers may not reach its intended destination—the rootzone.

Irrigated turf for sports fields serves a variety of good purposes, and the supplemental irrigation of these spaces helps contribute to these benefits. Irrigation efficiency is the key to the responsible use of our water resources, and large area rotors are important tools in the professional manager's arsenal. ■

• Design using head-to-head coverage. Head-to-head coverage (overlapping the spray from a sprinkler head with the spray from the sprinkler head next to it) maximizes irrigation efficiency. The higher the efficiency, the less time it's required to run the irrigation system to produce the desired results.

• Use sprinklers with the same precipitation rates within each zone. "Precipitation rate" refers to the amount of water sprays or rotors discharge in inches per hour. Always have sprinklers with the same precipitation rates running together on the same zones for an even application of water over the entire zone. When sprinklers with different precipitation rates are combined on the same zone, some areas of the zone will be overwatered and others will be too dry.

OTHER KEYS TO EFFICIENCY

• Regulate water pressure. High water pressure causes water to emit from sprays and rotors as fog or mist, often evaporating or drifting away in the wind and leading to longer run times. Every additional 5 pounds of water pressure (5 psi) over the sprinkler's optimum operating pressure causes each head to use 6-8 percent more water—an amount that can really add up over time. Pressure-regulating valves and swing joints can remedy this situation, as well as sprays and rotors with in-stem pressure regulation.

• Check nozzle efficiency. Distribution uniformity, or "DU," is the industry measurement of nozzle efficiency shown as a percentage or decimal. The higher your system's distribution uniformity, the less time it will have to run to achieve the desired results. You can determine your DU by conducting an irrigation audit on your own using a catch-can method, or you can have a third party perform the audit, such as the Center for Irrigation Technology or your sprinkler manufacturer.

• Schedule wisely. Evapotranspiration, or "ET," measures the rate that plants lose water through evaporation and transpiration. ET is calculated based on temperature, humidity, solar radiation, wind speed and rainfall. ET rates are typically lowest early in the morning, so water applied during that time is less likely to evaporate due to solar radiation. Wind speeds also tend to be lower in the early morning hours than at other times of the day, making it more likely for your irrigation water to land where it should and further improving system efficiency.

• Consider ET-based control. Using an ET-based control system can reduce irrigation frequency by as much as 30-50%. These systems gather local weather data to calculate a daily ET rate. This information then determines whether the system should run on any given day or whether zone/station run times should be adjusted. Even if your current controller is not ET-based, it's a relatively simple upgrade that can save a tremendous amount of water over time. ■

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 (Mg2+) and calcium (Ca2+) 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.