Rootzone | Joe Betulius

Saving water at the grass roots

Conserving water on a golf course means more than operating a finely tuned irrigation system, it means building a smarter golf course from the ground up. The first and most important ingredient of an efficient and well-maintained course is the soil itself. Performance and turf consistency are a direct reflection of the rootzone—this is where it all begins. Build performance in the soil and the grass will follow.

At the rootzone, the right soil mix can resist compaction, store moisture and nutrients, and deliver the oxygen your turf needs. A poor rootzone can be hydrophobic or retain excessive water, which can stunt root development, increase plant stress, and increase the need for additional fertilizer and pesticides.

Amending difficult rootzones

One of the most critical considerations made during golf greens construction or renovation is the soil mix. Designing and maintaining soils to resist compaction, increase drainage and balance capillary/non-capillary (water and air) pore space is the key to healthy, high-performance turf. Sometimes it is necessary to amend the soil.

Inorganic soil amendments provide the benefits of additional moisture and nutrient retention without sacrificing air and drainage pore space. Some inorganic amendments provide higher nutrient retention than traditional sphagnum peat, reducing the need for fertilizer throughout the year. A balanced soil should consist of approximately 50 percent solids and 50 percent pore space. The pore space should be divided evenly at 25 percent air and 25 percent water pores.

Soils for high-performing greens

Sand-based rootzones resist compaction better than native soil, but sand is not ideal for water and nutrient retention. To counteract this, amendments are made to the sand during construction. On the other hand, native soils tend to compact easily. Instead of water running through the rootzone, it often runs off, leaving roots dry, oxygen-deprived and soil-bound.

To alleviate some of the shortcomings of sand, peat has traditionally been added to hold water and nutrients. Unfortunately, organic amendments like peat change over time and can seal off the root zone, resulting in added watering costs. Porous ceramics do not change over time and consequently help maintain the soil porosity. The result is improved drainage and air space.

Testing soils is a critical first step in

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creating an ideal rootzone blend. By testing different sands and amendments, you can dial in a high-performance mix, maximize air values and hold the right amount of water without negatively influencing infiltration rates.

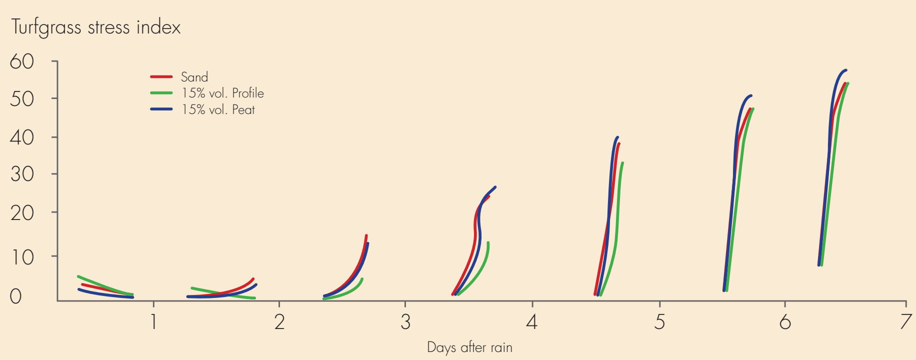
It is important to note that while the performance of a new mix may look good on paper, radical change starts to occur when the rootzone begins to mature the first year after construction. Excessive hand watering for localized dry spots or puddling of water on golf greens indicate that the soil lacks balance.

You get one chance to build greens correctly. Take the time to investigate and test the mixes at an accredited lab (the USGA recommends using only A2LA-accredited labs).

Root zone preparation at Desert Mountain in Arizona

TURF TESTING

Recent computer modeling studies, completed by Dr. Ed McCoy with Ohio State University, examined differences in watering frequency of three soil mixes on sand-based soils. The studies were completed using a validated simulation of water flow and turfgrass stress within a USGA putting green. They addressed rootzone water retention, hydraulic conductivity, turfgrass stress and rootzone aeration in three rootzone samples: unamended sand, a 15 percent by volume Profile Porous Ceramic, and a 15 percent by volume sphagnum peat.



Rootzone tests

The first test compared soil water content to soil water suction. The addition of porous ceramics to the root zone sand by adding both capillary and non-capillary pore space, allowing it to retain water and nutrients better than using sand or peat.

Next, the rootzone hydraulic conductivity was tested. The porous ceramic amended rootzone had the largest saturated hydraulic conductivity value. Additionally, using the porous ceramic in the sand-based mix helped draw the water upward to the rootzone.

Turfgrass stress index

The study also tested the turfgrass response to water-related stress over the course of seven days following rain. The porous ceramic amended rootzone delayed the onset of turfgrass drought stress by one to two days, extending the number of days between irrigation cycles.

Dr. McCoy tested the distribution of air-filled pore space within the rootzone, showing typical root zone depth following a heavy rain or extended period of rainy weather. The favorable aeration conditions in the porous ceramic amended rootzone allowed roots to extend approximately five centimeters deeper than the unamended sand or the sphagnum peat amended rootzones.

References:

McCoy, EL and KR McCoy. 2006. Dynamics of water flow in putting greens via computer simulation. USGA Turfgrass and Environmental Research Online 5(17):1-15.

McCoy, EL and KR McCoy. 2008. Simulation of putting-green soil water dynamics: Implications for turfgrass water use. Ag. Water Mgmt. (in press, doi:10.1016/j.agwat.2008.09.006).