Fertility Management of Sand As A Growing Medium for Turfgrass

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The development of high sand content sports fields and golf greens has been heralded as a major advance toward the multipurpose, all-weather utilization once thought possible only with artificial turf. It seems, however, that these rugs have as many problems as natural turf except inside domed stadia.

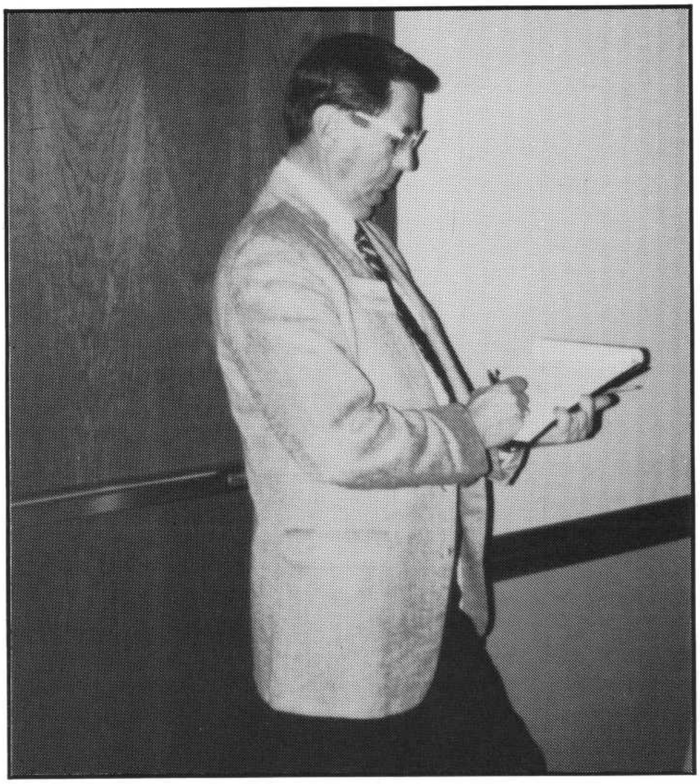
The sands are far from foolproof and finding the right components for a mixture does not end problems in a sand-based program. Fertility management can be difficult and the related problems as insidious as any faced by a turf manager. The major problems are related to high leaching potential, low cation exchange capacity, nutrient balance difficulties and other problems related to pH levels. These things were considered to be worthwhile trade-offs when compared to problems associated with highly compactible, poorly drained (and aerated) soil mixtures used in the past.

High sand-growing media are supposed to support traffic and drain readily. That same porosity makes nutrient retention quite difficult and nitrogen is particularly subject to loss due to the very nature of the sandy substrate. Ammonium ions (NH4) are rapidly converted to nitrate ions (NO3) in the well-aerated sand. The nitrates have no physical attraction to negatively charged soil or organic matter and are readily washed out of the root zone by the sand's high permeability.

At first face this leaching loss indicates that slow release nitrogen sources are naturals for porous media turf growth. This is not always the case, since sand is essentially sterile or at least has a small population of microorganisms. The release of nitrogen from sources requiring microbiological breakdown is, consequently, slow for a while. These products are ureaformaldehydes, methylene ureas, process tankages, sewage sludges, etc. Encapsulated particles, IBDU, etc., are not so limited. The restriction release does not last long, but must be considered in the early stages of use. Combinations of soluble and insoluble sources of nitrogen produce the best results until the population of microorganisms grows.

Another penalty to be reckoned with is low cation exchange capacity. We have lost the forgiveness of soil. Clays and organic matter have a tremendous capacity to absorb cationic nutrients, which reduces leaching loss. In sandpeat mixtures, though, the total Cation Exchange Capacity is around 5 and that means that this mode of nutrient retention is very low. Additionally, the normally weak adsorption of potassium on clay or organic matter is readily overcome by irrigating with hard water, which contains high concentration of calcium and magnesium ions. Furthermore, we have always heard that phosphorus does not leach but accumulates in the upper root zone. This does not occur in sands. The phosphates go right on through - just like the nitrates. Trace elements or minor nutrients may be lost in the same way, but the manner of their availability is not as clear because the chemistry of these nutrients has not been worked out in this medium or with turfgrasses.

One of the most confounding problems with sand relates to its pH. We usually expect sand to have a neutral pH of 7, but this is seldom the case in the central U.S. Soil tests show pH levels up to 8 or more, indicating high calcium levels. Sands with alkaline reaction are subject to close observation and careful application of trace elements thought to be needed. In most cases, it is iron. These nutrients should be applied individually to determine the reaction of the turf. Shotgun mixtures are not recommended, because of potential toxicity from overapplication of the wrong nutrient, but don't forget that the alkalinity also offers some protection against toxicity due to excess copper and zinc levels.



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Nutrients should be applied as in hydroponic gardening until the root system is well established and has cycled through death and reestablishment of new roots several times. The residual left by dead roots is the best potential for maintaining nutrient stability throughout the root zone. It also provides the nutrition needed to develop adequate populations of beneficial organisms. Only then can a stable plant community be established and dependable nutrient balance based upon a well established fertility management program be developed.

One final word of caution is needed in relation to optimum use of sand. That is the possibility of contamination. These growing media with little or no buffering capacity are susceptible to contamination by poor chemical water quality, overuse of pesticides, and even silting in by dust storms or muddy water. All in all, sand as a growing medium for turf is a major advance in our field. It is imperative, however, to select the sand carefully, approach nutrition programs with knowledgeable caution and revise almost everything one has learned about turf management using natural soils. Since we have lost the forgiveness of soil, we must make up for the loss by a better understanding of the material with which we now work.