

How to Evaluate Soil Materials for Construction and Topdressing

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The importance of selecting a suitable soil material for new construction or for topdressing can not be overstated. The costs of green construction is enormous often running in the hundreds of thousands of dollars. Also, if the cost were not enough, having to rebuild improperly constructed greens would take the course out of play for at least a year. As for topdressing, the topdressing material that is used becomes the new root zone. If not selected properly, this topdressing layer can become a zone of unwanted material that is difficult at best to manage.

The characteristic of a desirable root zone media are:

- * Minimum tendency for compaction
- * Good water infiltration/percolation rate
- * Adequate aeration for deep rooting
- * Some resiliency
- * Free from toxic chemicals
- * Active microorganism population
- * High cation exchange capacity
- * Adequate water retention

Soils vary greatly in their physical and chemical properties as show below:

Soil Texture	Physical Characteristics		
	Drainage	Ease of Compaction	Water/Nutrient Holding
Sand	excellent	none	limited
Loamy sand	"	limited	limited
sandy loam	good	limited to moderate	moderate
Loam	good to fair	moderate	moderate to substantial
Silt loam	fair to poor	substantial	substantial
Clay loam	"	"	"
Clay	poor	"	"

The range in properties observed in some soils is relate to the degree of soil structure each has. Finer textured soil can have fair drainage if they have a well developed structure or be poorly drained if the structure is absent. Thus, it is obvious from a golf course perspective that soils of either the loamy sand (>70 % sand) or sand texture would be required to have most of the desirable characteristics in the root zone.

Just saying that a soil must have a high sand content is not enough to make a determination as to the suitability of a root zone mix. Sand is defined as particles having a diameter of less than 2.00 mm but greater than 0.05 mm. Thus, to evaluate sand the break done, by weight, of each sand separate is often recommended. Sand separates are classified as follows:

<u>Separate</u>	<u>Diameter (mm)</u>	<u>sieve size(openings/inch)</u>
very coarse sand	2.00-1.00	10
coarse sand	1.00-0.50	16
medium sand	0.50-0.25	32
fine sand	0.25-0.10	150
very fine sand	0.10-0.05	270
Silt	0.05-0.002	
Clay	<0.002	

The standards most often followed for selecting a soil for either new construction or topdressing were developed by the USGA Greens Section. Their suggestion for particles size range are to avoid particles > 2.00 mm, most should fall in the range of 0.75 to 0.25 mm (Coarse to medium sand), no more than 10% fine and very fine sand, and no greater than 5% silt and 3% clay. A root mix of this nature often will have a good infiltration /percolation rate, resist compaction and have limited nutrient /water holding capacity. It is recommended to that all soil materials be tested before being used. The minor cost of testing is the only way to make an intelligent decision on selecting a suitable material.

Other properties of sand that are important are the chemistry and shape of the sand. Many sands are very high in quartz while others originated from limestone deposits. Quartz sand is often very infertile, thus, more attention to nutrition is necessary. Limestone or calcareous sands can be moderately fertile, but by definition have a high pH often near 8.3. High pH sands are more suspect to micronutrient deficiencies. In either case, nutrient management is important. Rounded sands are preferable to sharp or angular sands for several reasons Rounded sand particles will bridge under traffick, thus be less likely to compact than sharp sands. Also, sharp sands are more destructive to mowers and are though to be related to greater plant injury under traffick.

The second major component of a golf course soil is organic matter. There has been some controversy as to the need for organic matter in the root zone mostly in topdressing but also for new construction. The some of the benefits of adding organic matter to sand are to improve the moisture/nutrient holding capacity, reduce

the potential of pesticide leaching and for a faster establishment. Thus, adding organic matter is desirable. Usually it is recommended to use a fibrous organic material like sphagnum peat, reed sedge peat or peat moss not materials like saw dust or composts high in wood chips. The source used should be very high in organic matter, so that it does not contain too much mineral matter which is often very fine in nature. Most often it is suggested not to exceed 20 % organic matter, by volume, in the root zone mix.

Many of the same advantages of adding organic matter go for having some soil present. Care must be given in determining the amount of a soil to add as well as mixing the soil into the sand/peat.

There are several questions that you should answer to aid you in deciding what material to use for topdressing. The first question is , are you satisfied with the current performance of the green? If yes, then you should try to match the topdressing to the existing soil as close as possible to avoid the dangers of layering. If you answered no, then select a topdressing material that has the physical and chemical properties that you want. The second question revolves around the selection of a new material, straight sand verses a soil mix containing sand/organic matter/ or soil. The trend has been to use just sand due to lower cost, difficulty of obtaining other topdressing materials and ease of application of sand. The question is would you build a green out of straight sand? If you answered no then you should not topdress with straight sand because that is in fact what you are doing. In the long term topdressing will result in the development of the a new root zone. Thus, what you select is very important.

In summary, selection of the soils for new construction or for topdressing is one of the most critical decision a superintendent must make. If you make the right decision your job will be much easier. However, the wrong decision will eventually cost you a lot a money to renovate the site or your job.