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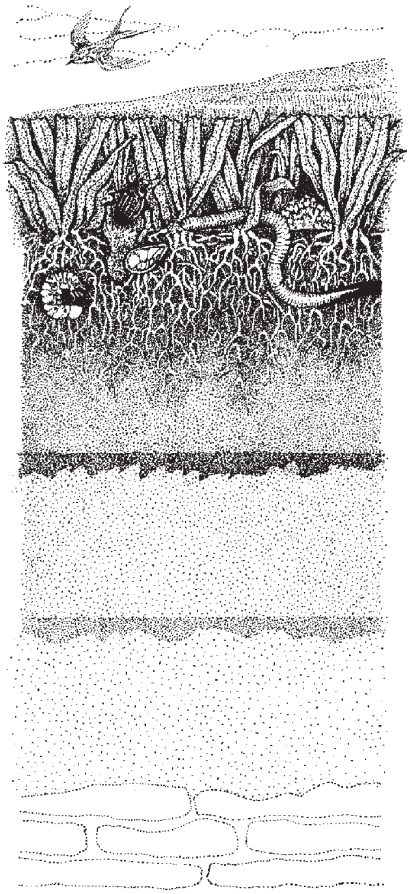

When A Sand is Not Just Sand

Imagine spending $300,000 to construct a new sports field or 18 golf greens out of sand, and then find that they don't drain or are extremely hard. Is this possible? You bet it is! Unfortunately, it happens far too often.

Sports and golf turf areas are increasingly being built with sands, or soils modified with large amounts of sand. Sands with uniform particle size will resist compaction, provide excellent surface drainage and soil aeration. Selecting the proper sand, however, is most important to achieve these characteristics. I often remind people that sand is also used in concrete, mortar, and bricks ■

What Sands Are Best?

Sand is a loose granular material that formed through the weathering of rock. A technical definition of sand is a soil particle between 2 and 0.05 mm in diameter. Sands found in New York State can be either quartz calcareous. Quartz or sand is generally preferred as a growth medium because it is chemically inert. The chemical and physical makeup of turf areas constructed with quartz sands should change very little through time. Natural deposits of quartz sands can be found near Rome, NY, much of the Adirondacks, the Catskills, and Long Island. Quartz sands are also available from several out of state sources (Table 2).

More common in New York are the calcareous sands. Formed from limestone rock, calcareous sands may contain as much as 15% free calcium carbonate (lime). These sands will therefore have a high pH, and are well buffered from any attempts to change pH. Calcareous sands are very chemically active, and very prone to further weathering. Despite these drawbacks, many successful installations have been made with calcareous sands.

The particle size and uniformity of a sand are of greater immediate importance than the chemical makeup. Many terms are used to describe sands, including masonry, block, plaster, construction, trap, and others. These terms are descriptive of the intended use of the sand, but say nothing of its particle size or uniformity. To

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Sand

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better describe sands for turfgrass use, we separate them into five classes based on particle diameter. Table 1 lists the five separates that can be easily determined by sieving. Only by fractionating sands through sieves can we learn if a sand is suitable for construction.

Sands should be uniform in particle size, that is, most of the sand should fall within two adjacent size classes (eg. medium-coarse). Sands with particles split across several size classes would tend to "fit" together, plugging much of the pore space between grains.

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Table 1. Size Distribution of Sands

Tyler Screen Scale	Size (mm)	Designation (sand retained)
9 mesh	2.0 mm	Gravel
16 mesh	1.0 mm	Very Coarse Sand
32 mesh	0.5 mm	Coarse Sand
60 mesh	0.25 mm	Medium Sand
150 mesh	0.1 mm	Fine Sand
270 mesh	0.05 mm	Very Fine Sand

Sands with a large percentage of particles between 2 and .25 mm in diameter will cause the greatest change in the physical properties of soil. These coarser sands should be selected when attempting to modify an existing soil. Finer, uniform sands may be used, but much larger amounts will be required to produce the desired effect.

The United States Golf Association Green Section has developed their own set of specifications for greens construction that are widely accepted. The specifications state that a uniform sand between 1.0 and 0.25 mm should be used for greens mixtures, with 75% of the sand falling between 0.5 and 0.25 mm. No more than 10% of the particles should pass through a 60 mesh sieve (<0.25 mm).

Table 2 shows that many sands found in New York are very uniform, but fine in particle size. While these sands may have limitations as amendments to improve soil, they may be excellent for pure sand greens or athletic fields. We have found through our own experience maintaining pure sand greens at Cornell that it's much easier to maintain turf on the finer sands (Marcellus products) than a coarser sand (Blue Ridge).

Modern greens and athletic fields are constructed from sand.

Testing Sands

Sands should be tested prior to using them for modification to assure they will improve soil physical properties. Aside from testing the suitability of the sand, tests can also determine the quality of organic matter sources, and the optimum ratio of sand to soil or peat to use. The Physical Analysis Laboratory at Cornell routinely conducts these tests, as do other labs around the country. Considering the tremendous investment in time and money involved in constructing greens or sports fields, soil testing is a small but crucial first step in assuring success.

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Table 2. Several sand sources available in New York State.

Sand Source	Particle Size (mm) 2-1 VC	1-0.5 C	0.5-0.25 M	0.25-0.1 F	0.1-0.05 VF	Type
Porter's Concrete, Waverly	9%	25%	52%	12%	2%	C
Porter's Mason, Waverly	0%	4%	39%	46%	11%	C
Marcellus Products, Syracuse	0%	2%	36%	56%	6%	C
Frey Bros. Mason, Batavia	5%	19%	49%	26%	1%	C
Bryant Sand, McConnellsville	0%	5%	32%	57%	6%	Q
Herba Trap Sand, Albany	6%	22%	41%	28%	3%	C
Carned Sand, Albany	1%	16%	71%	11%	1%	C
Saunders Sand, Syracuse	1%	10%	51%	37%	1%	C
Lynn Scott, Blossvale	0%	6%	48%	42%	4%	Q
Eastern Rock, Syracuse	2%	25%	47%	23%	3%	C
Fertl Soil CM, Pennsylvania	14%	54%	28%	3%	1%	Q
Egypt Farms, Maryland	4%	28%	55%	12%	1%	Q
Harford CM, New Jersey	5%	29%	55%	10%	1%	Q
Best Sand, Ohio	1%	75%	23%	1%	0%	Q
Partac Peat, New Jersey	5%	21%	55%	18%	1%	Q
Blue Ridge, Pennsylvania	1%	5%	74%	15%	5%	Q

Every attempt has been made to provide accurate information. Variation in particle size analysis can result from sampling techniques. Type of sand was not determined by mineral analysis, but rather from pH measurements and the presence or absence of calcium carbonate.

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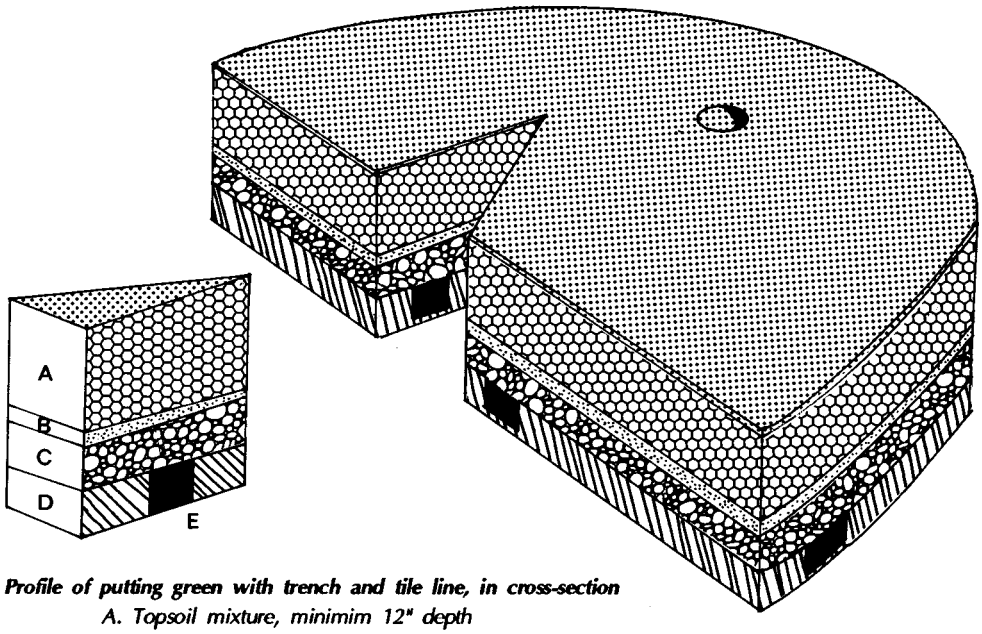
The USGA greens section has developed one concept in greens construction using sand.



Profile of putting green with trench and tile line, in cross-section

A. Topsoil mixture, minimim 12" depth
B. Very coarse sand, size 1 mm or greater , 1 1/2" to 2" depth
C. Gravel, preferably pea gravel 1/4" to 3/8" diameter, minimum 4" depth
D. Subgrade of native soil or fill material
E. 4" diameter tile

Sands should be tested prior to using them for modification to assure they will improve soil physical properties. Aside from testing the suitability of the sand, tests can also determine the quality of organic matter sources, and the optimum ratio of sand to soil or peat to use.