Rootzone

Determining the best rootzone for a field can be a difficult decision. Because the rootzone determines field quality, sports turf managers are always looking for the best available growing medium. The two main types of rootzones are native soils and sand based soils, and both have their advantages and disadvantages.

Native Soil Rootzones

Native soils provide exceptional playing surfaces as long as they are properly designed and maintained. This type of soil is a good choice for lower profile fields with limited budgets and higher frequency and intensity of use. Native soils tend to have higher water and nutrient holding capacities which provides a better growing medium for grass plants. Native soil fields are more likely to become compacted in a shorter amount of time depending on the intensity and frequency of use, but if compaction can be prevented with routine maintenance and renovation, these fields will have excellent traction and playability. Unfortunately these soils are influenced the most by weather conditions. If the field is used in periods of high soil moisture, the soil structure can be destroyed, therefore causing compaction and surface rutting. If this occurs, usually renovation is the only way to restore the field.

Sand Amended Native Soil Rootzones

Sometimes in an effort to increase drainage and decrease compaction, sand is added to a native soil in a topdressing program or with aeration. Sports turf managers must exercise caution when doing this, because in some cases, instead of correcting a problem, more can be created. In order to increase the permeability of a native rootzone, fields typically require 60% or more sand on a volume basis. Even then, significant increases in drainage and aeration properties are not typically observed until sand volume proportions exceed 80% or more depending on particle size distribution of the sand and soil components. It is also important to keep in mind that proper and thorough mixing of the sand and soil can only be achieved when the soil is mixed offsite. Otherwise, a marbling effect will occur.

Sand Based Root Zones

A sand based root zone offers many advantages including high water permeability and resistance to compaction. This allows for frequent use and the ability to withstand variable weather conditions. Some disadvantages associated with sand rootzones include poor surface stability, poor water and nutrient holding capacity, and high costs for maintenance.

Because of the advantages sand holds for a rootzone, it is a desirable choice for sports fields. However, there are important considerations to take into account when building a sand based root zone. These include size range distribution, surface firmness, rootzone depth, nutrient and moisture retention, and sand particle stability.

Size range distribution refers to sand particle sizes. Large particle sizes can create unstable playing surfaces while finer particles can compact and eventually cause drainage problems. Selecting the best particle size is largely dependent on the primary sport being played on the field as well as the field's geographic location. Once sand is selected, it should always be tested before installation to ensure its quality. Particle size distribution also influences surface firmness, which is the ability of a sand layer to resist surface forces such as foot and equipment traffic. If the turfgrass wears away, the surface can become unstable. In order to maintain stability, the rootzone must be made up of a good size range. The following graph gives sports field rootzone recommendations from Penn State University, University of Minnesota, the United States Golf Association (USGA), University of California, the Pacific Northwest Cooperative Extension, Mississippi State University, and Prescription Athletic Turf (PAT).

Recommended Particle Size Distributions for Sports Fields

Name	Fine Gravel >2 mm	Very Coarse 1-2 mm	Coarse .5-1 mm	Medium .25-.5 mm	Fine .1-.25 mm	Very Fine .05-.1 mm	Silt .002-.05 mm	Clay <.002 mm
Penn State		95% (60% should be in the medium range)						
Penn State	<10%	<10%	50-75%		<25%	<10%	<15%	
Univ. Minn.	3% max		60% min		3% max			
USGA	3% max	7% max	60% min		20% max	5% max each, not exceeding 10% total		
Univ. Calif.	<10%		82% min			8% max		
Pac. NW	30% max		70% min		15% max	10% max	5% max	

Miss. State	15% max		>60%	25% max		12% max	
PAT	3% max	10% max	60-80%	5-20%	5-10%	6% max	6% max

Table courtesy of Sports Fields: A Manual for Design, Construction and Maintenance

The rootzone depth depends on the particle size. Depth is determined by the amount of water that must be held in the sand before gravity breaks the tension and allows the water to drain through. A root zone that is too shallow can lead to a playing surface that is excessively wet. With proper depth, nutrient and moisture retention decrease because of high permeability. To increase surface firmness and nutrient and moisture retention in a sand based rootzone, soil amendments can be added. These include organic, inorganic and synthetic. There are advantages and disadvantages when using soil amendments and the sports field manager should always research the product before applying it to the field. Finally, sand particle stability is dependent on how resistant the sand is to weathering and fracturing. If the sand is susceptible to weathering and fracturing, there could be a change of chemical properties in the soil which could lead to nutrient deficiencies.

For the most successful sand based rootzone, it is recommended to use controlled release fertilizers, have careful water management and accurate pesticide applications, and pay close attention to pH, fertility and disease infestations.

To compare native soil with sand root zones, please visit the following website:
Ontario Ministry of Agriculture, Food and Rural Affairs
http://www.omafra.gov.on.ca/english/crops/facts/soilsand.htm

References: The information for this section was taken from the article Pros and Cons of Sports Field Root Zone Constructions by Michael DePew.
Additional information was taken from the book Sports Fields: A Manual for Design, Construction and Maintenance by Jim Pulhalla, Jeff Krans, and Mike Goatley.