FOR MOST TURF, YOU WANT A COMBINATION OF SAND, SOME SILT, AND A BIT OF CLAY. THERE IS NO "BEST" TEXTURE, SO DON'T EXPECT TO FIND IT.

"old pro," then you can learn how to evaluate soil fairly effectively just by using your own senses. Remember, soils can change, so it is best to periodically (every 2 years) re-evaluate your soil.

Soil evaluation techniques

What is the texture of your soil? Take a handful of soil and add enough water to make a stiff paste. Squeeze the paste between your thumb and index finger. If a ribbon is produced and extends an inch or more, you have a lot of clay: your soil will present challenges for managing soil water and maintaining a good dense turf. If the ribbon breaks off quickly, you have more silt; and if it crumbles real fast, you have a lot of sand.

Texture refers to the size and number of particles that make up soil. Clay particles are very small, and sand particles are very large. The larger the particles, the greater the drainage, gas exchange, etc., but the less the soil can retain water and nutrients. So for most turf, you want a combination of sand, some silt, and a bit of clay. There is no "best" texture, so don't expect to find it. For skinned areas of baseball or softball fields, you want a clay soil that does not drain well at all and is very "sticky" when wet.

How much organic matter does your soil have? Organic matter is usually dark in color, and generally makes up about 2.5% of the soil mass in agricultural soils. You can estimate the amount of organic matter based on the color of the soil: A dark soil generally has more than 2.5%, and a light-colored soil has less than 2.5%, but this is a very crude estimation.

In my opinion, soil organic matter content is highly overrated in terms of importance for turf establishment. This is because turf, itself, produces a tremendous amount of organic matter, and this gets added to soil. Too much organic matter can cause the pores in soil to be restricted in terms of water and gas movement, thus reducing the ability of the grass to grow. Some people think, especially in terms of sand soils used for turf establishment, that about 10% organic matter should be added to improve the moisture and nutrient-holding capacity of the soil. I disagree. Within a short period of time, seed and sod will produce all the organic matter that they need, and often too much.

During the establishment phase of turf in sand soils, there is a need to assist the young roots in terms of getting adequate moisture and nutrients. However, this can be done effectively using inorganic materials,

IN GENERAL, AS THE RATE OF INFILTRATION GETS HIGHER, YOU WILL NEED TO IRRIGATE MORE AND MORE OFTEN, BUT RAIN DELAYS ARE LESS LIKELY.

like calcined clays, which hold and release water without breaking down and facilitate nutrient availability.

How deep is the top layer of your soil? What you want to determine here is the depth of the "top" soil layer down to the next type of soil layer, i.e., a different texture or color of soil below the top layer. Use a soil probe to look for changes in texture or color as a means of identifying the location of the soil layers. You might find good agronomic soil layered over a clay layer. A top layer of turf soil should be 6 or more inches deep. I have seen a lot of turf grown on 4 inches of suitable soil, but this thin layer of soil will be subject to desiccation and movement. The thickness of the "top" soil layer will also affect drainage and soil heating/cooling.

How fast will water flow into your soil? Saturated flow is a measure of how many inches/hour of surface-water a soil will absorb. First, you saturate the soil; then you keep applying water to the soil, and measure how fast the water is taken into the soil. A crude method to do this is to drive a large (8-in. diameter) bottomless coffee can into the soil about one inch. Fill the can to the top with water, and time the loss of water from the can. Measure how long it takes for the water to drop one inch. Repeat this, until the time to drain one inch of water is the same for three measurements. Now you know the hydraulic conductivity in inches of water per hour.

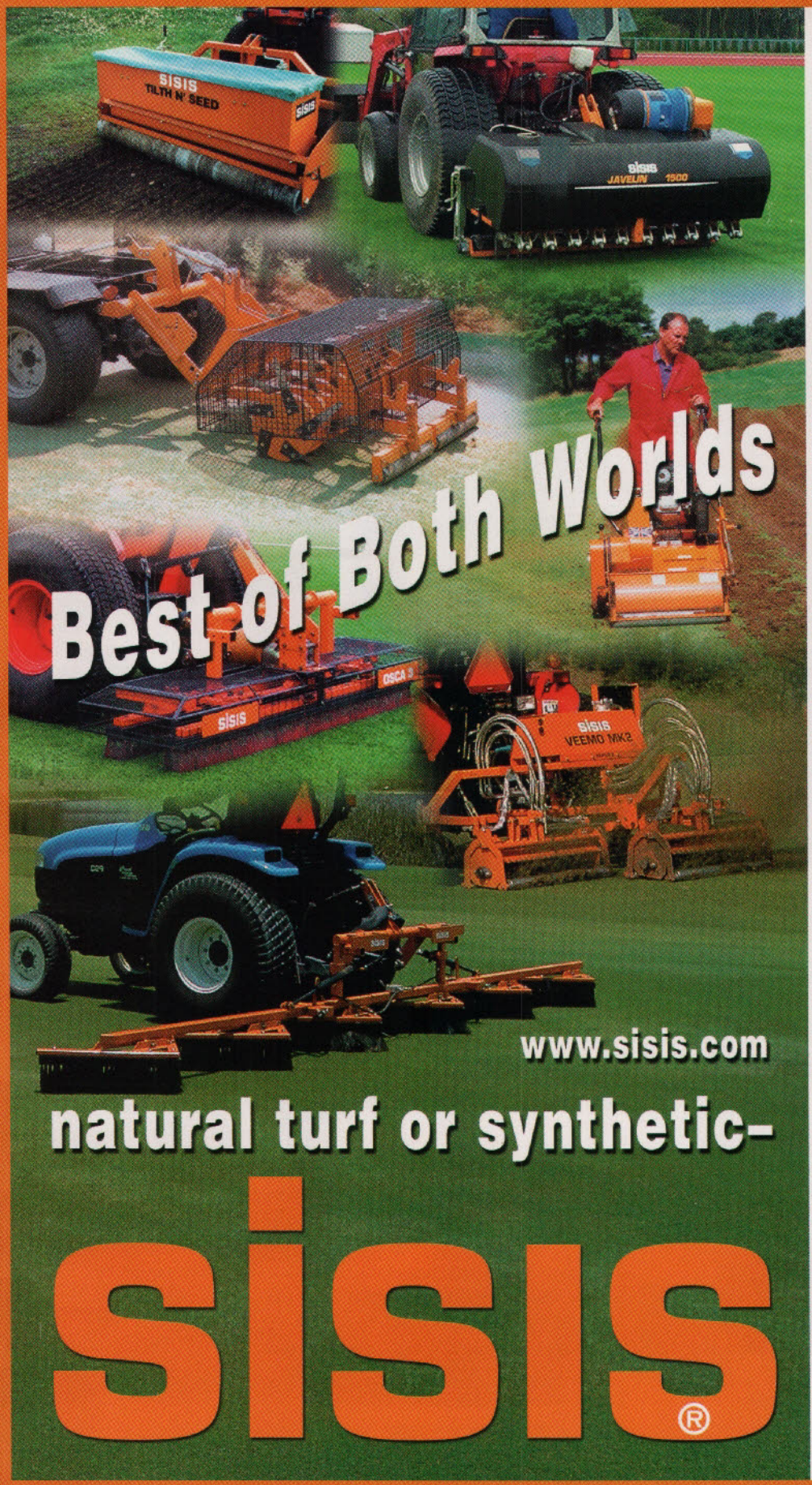
If you did this on a turf, strip off the turf and repeat the exercise on bare soil. Try this before and after you incorporate a soil amendment. For a sports field, you want a minimum of three inches per hour. In general, as the rate of infiltration gets higher, you will need to irrigate more and more often, but rain delays are less likely.

How dense is your soil? This is important to understand because the density of soil will determine how well it conducts water, lets in air, and grows grass, and how hard it feels to the athlete. There are tools to measure this, but it takes practice and experience to really be able to differentiate between compacted soil and non-compacted soil. Different soils compact at different rates, and generally, wet soils compact faster than dry soils. You might have to get some help on this one.

What is your problem?

It is very important that you define why you think you need a soil amendment before you select one and develop a plan for using it. Here are just a few situations that might call for a soil amendment:

For new construction: It will be a sand-based field; the native soil has clay in it; and the field will be used intensely with a limited amount of time to overseed.



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INORGANIC AMENDMENTS RANGE IN STABILITY, OR LONGEVITY, IN A SOIL FROM MONTHS TO MANY YEARS; POROUS CERAMIC CLAYS, FOR EXAMPLE, WILL LAST MORE THAN 30 YEARS!

For renovation or repair of existing field: The infields are hard, and become sticky when wet (wet clay); the field is a clay soil; the grass grows poorly in the summer; frequent rain delays occur; and better methods are needed to reduce water use and fertilization.

How to choose an amendment

What are the properties of various soil amendments? All soil amendments can be described by the nature of their physical properties or their impact on soil behavior: texture, nutrient exchange, particle stabilization, soil acidity (pH), and porosity of the particles.

Any material added to soil is considered a soil amendment. They can be divided into inorganic and organic, or natural and synthetic, and usually refer to materials that are used to change the texture, porosity, and stability of soils. Amendments are normally incorporated into soil using tillage, but they are also applied in conjunction with aeration as topdressing. Inorganic amendments range in stability, or longevity, in a soil from months to many years; porous ceramic clays, for example, will last more than 30 years! Microbes degrade organic amendments and some synthetic amendments: therefore, the level of microbial activity in a soil determines their longevity. For example, nylon, plastic and rubber are all synthetic materials that will be degraded by microbes, heat, and light. Amendments most effective in improving soils for turf establishment change the soil texture and porosity.

Textural amendments

Textural amendments change the porosity of soil for a considerable period of time. For each type of textural soil amendment, the questions you need to ask include:

Continued on page 18

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John Mascaro's Photo Quiz

Can you identify this sports turf problem?

Problem: Brown hard area on field

Turfgrass Area: Athletic Field

Location: University of North Texas

Grass Variety: Celebration Bermuda

Answer to John Mascaro's Photo Quiz on Page 42

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DON'T LAYER OR TOPDRESS A SOIL WITH A SOIL AMENDMENT AND EXPECT TO ACHIEVE VERY MUCH. IF YOU ARE GOING TO ADD AN AMENDMENT, MIX IT INTO THE SOIL.

How much textural amendment do I have to add to achieve a good turf soil? This is not an easy question to answer just by looking at the soil. Each soil will differ in composition, and will react or interact with each soil amendment differently. You need to know the properties of the amendment you are using–what is it made of? Will it break down over time? How does the manufacturer recommend using it? Ask others who have used a product how they used it and how their fields responded.

What is the difference between soil amending and soil layering? Soil amending is incorporating of a material into a soil. Soil layering is adding an amendment onto the surface of a soil, without incorporation. Soil layering is also called topdressing, and must be done slowly and infrequently or it can damage turf. Generally, it is done to improve the quality of the sports field surface, and not the health of the turf. This type of soil layering is best done with non-porous materials (like sand) or non-porous materials amended with small amounts of porous materials (like calcined clay).

Test to determine how much soil amendment you need to add. If you have done the ribbon test and are sure you need to amend the soil, you can crudely determine how much amendment to add. To a known amount of your dry soil, add a known amount of the amendment you are considering: blend it with your hand, moisten it, and do the ribbon test. This will tell you about how much you need to add. To do this with more accuracy, get a soils expert to help you test the hydraulic conductivity.

Mix your soil amendment three or more inches deep. Don't layer or topdress a soil with a soil amendment and expect to achieve very much. If you are going to add an amendment, mix it into the soil. That is the only way it will work. Three inches is about the minimum depth to get some good out of it. Six inches is better, and about the best you can do. A very effective method for mixing is to blend about 1/2 of the amendment to a depth of six inches, then come back and blend another 1/2 rate into the top three inches. This will give your soil a gradual texture change, and will encourage more rooting to six inches or deeper.

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IF YOU USE TOO LITTLE OF THE WRONG SIZE OF SAND, YOU CAN ACTUALLY REDUCE THE POROSITY OF THE SOIL, ESPECIALLY WHEN ADDING IT TO A CLAY SOIL.

For existing turf fields, combine aerification and soil amending. Aerify the soil heavily (holes every 2 inches), then topdress and drag the soil amendment into the holes. Remember when you use this method, it is generally not a good idea to add undiluted amendment. Dilute the amendment with a non-porous material, like sand or soil similar to your field soil.

Be careful not to use too much or too little amendment. Amendments will interact with soil differently. For example, if you use too little of the wrong size of sand, you can actually reduce the porosity of the soil, especially when adding it to a clay soil. With materials like calcined clays, adding less than you would like is not a problem; but adding too much can lead to a soil that dries too quickly.

Make sure your soil and soil amendment are dry. Never add soil amendment to moist soil: it will not mix well. When preparing to amend a soil, it is best to do so when the soil is dry. Working wet soil will greatly increase your costs, because you will have to rework the soil to reduce the clods. Never add wet soil amendment to soil. If the amendment is wet, spread it out on the soil and wait a day before you mix it in.

A general recommendation for mixing in a soil amendment is to do it off-site. This is a great idea, but very seldom is it practical to do. You can get a good effect by uniformly spreading the soil amendment out on the surface of the soil, raking it to achieve a uniform layer, and then tilling it into the soil. Rototilling is the most common method; but a rotavator does a better job because it stirs the soil vertically, not horizontally like a rototill. Also, realize that you can add amendment in steps, to achieve a better mixture of soil and amendment.

Don't be afraid to use natural soil as a soil amendment. If you are dealing with a clay soil, it is possible to add a sand loam or other low clay-containing soil to it. Again, you need to test it to see how much is needed to improve the texture. I would be cautious in adding sand to a clay soil; it is so different in texture compared to a clay, that you can actually reduce porosity. Your amended clay soil could turn into "cement."

Dr. Henry T. Wilkinson is a Professor of Turfgrass Diseases at the University of Illinois. ■