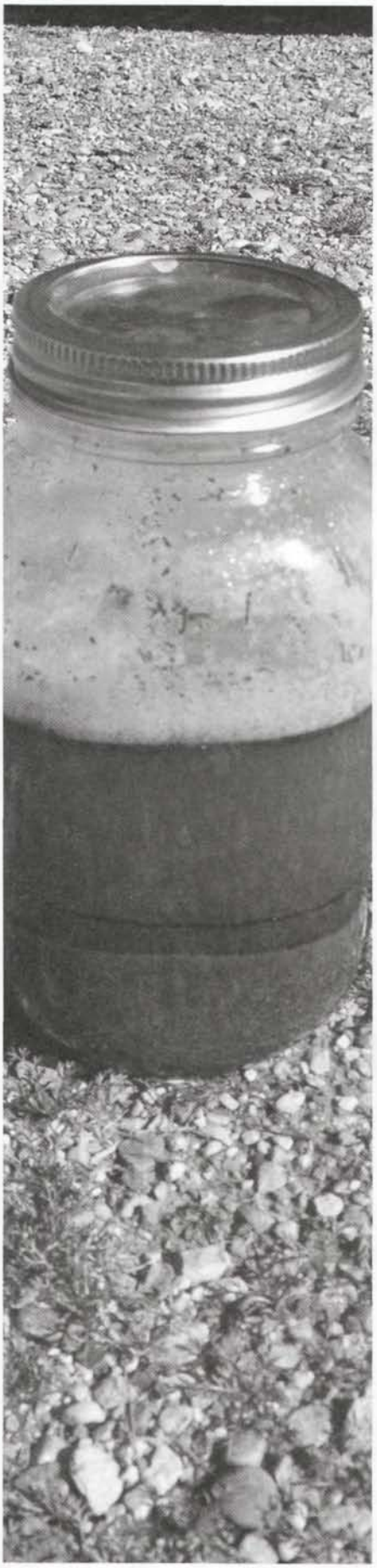

Tools & Techniques for Sports Turf Managers

18TH ANNUAL STA FIELD DAY COVERAGE CONTINUED...

At the Annual Sports Turf Association Field Day, the Guelph Turfgrass Institute Turf Team had the opportunity to demonstrate *Smart Tools for Sports Turf Managers*. We focused on tools that will assist you in better managing your soils. The article below summarizes our session and outlines in several easy steps how to take a soil sample and also how to determine soil texture.

Before we get into the step by step outline, let's first review why it is important to know soil fertility and texture. The only way to accurately determine how much and what analysis of fertilizer to use is to take a soil sample and have it tested at an accredited soil testing laboratory. To insure the quality of the information, proper sampling is important.

How to Take a Soil Sample

Step 1. Assemble the required tools: a soil sampling tube or a shovel, a clean plastic pail, and sample bags that hold at least half a litre of soil

Step 2. For sports fields, sample as deep as the turfgrass roots. This is usually 10-15 cm.

Step 3. Take at least 20 cores for each field. The more cores the better. Remove the thatch and grass layer and discard it. Sample problem areas separately.

Step 4. Place the individual cores from the soil sampling tube in the plastic pail. Mix thoroughly to break up any lumps and remove any stones. Take a representative 1/2 litre sample of the mixture.

Step 5. Place the soil sample in a plastic bag and label it. Most accredited soil test labs in Ontario have websites with soil sample forms online. The Ministry of Agriculture, Food and Rural Affairs site lists the Ontario accredited soils lab at www.omafra.gov.on.ca/english/crops/resource/soillabs.htm. Print off a soil sample form and complete it with accurate information. Make sure to specify which type of turf you require a recommendation for (i.e. home lawn, sports field, greens, tees or fairways).

Step 6. The recommendations of how much phosphorus and potassium that are required are usually given in the soil fertility test results. These recommendations can also be found in OMAFRA Publication 384, *Turfgrass Management Recommendations.* Information on how to obtain this publication is also on the OMAFRA website.

On average, soil samples should be taken every two to three years. If you have never performed soil tests on your sports fields, now is a good time to start. Pick a few each year to sample to get the process underway and resample in 2-3 years time. Remember that there is no accurate test to determine the nitrogen needs of your sports fields. This is usually done by the rule of thumb of roughly 200 kg of N/ha per season.

Determining Soil Texture

Soil texture refers to the amount of sand, silt and clay present in a soil. Most accredited soils labs can perform tests to determine soil texture. This can take up to a couple of weeks. You may find yourself in a situation where you need a quick method to estimate what your soil texture is. This could be an existing soil in a root zone or it could be a load of soil that has been delivered to a site where a sports field is being constructed. Below is a description of a quick field method that will give you a rough idea of the soil texture.

Step 1. Fill a mason jar about one-third full with the soil you want to test. Pack it in and mark the top of the soil level on the side of the jar with a permanent magic marker.

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Figure 1. Portable field pH meter.

Figure 2. Portable field EC meter.

Figure 3. Sampling tools: cup changer (top), slab sampler (middle), soil probe (bottom).

Step 2. Add water to the jar to fill it to about three-quarters full. Put the lid on the jar and shake vigorously for several minutes. Set the jar down and wait for the soil particles to settle out. The sand will settle out in a couple of minutes, the silt will settle out in an hour or two and the clay will remain in solution (see picture on page 14).

Step 3. To determine the soil texture, measure the sand and silt layers as a percent of the depth of the original soil. To obtain the percent clay, subtract the sum of the sand and silt from 100.

Soil Chemistry

Compared to soil texture, assessing aspects of your soil chemistry will involve slightly more elaborate tools, and the value of the information will increase as you make repeated observations and record both normal and unusual conditions. Soil chemistry will change over the season, particularly as fertilizer applications are made, and there may be times when a snapshot of your soil chemistry will help diagnose rootzone problems and suggest solutions.

Soil pH. The acidity of the soil is measured by its pH, which can range from acid (0 to <7) through neutral (~7) to alkaline (>7 to 14). Turf grows best (availability of nutrients, susceptibility to disease) at a pH between 6.5 and 7.5, so if you can monitor your soil pH, you may be able to anticipate problems. pH measurement involves a pH meter, which has a sensing electrode and a readout unit. There are versions available that can be used *in situ* on undisturbed soil in the field (Figure 1). They are fairly robust and not too complicated to use, ranging in cost from ~$200 up to $800-900 for more sensitive units. Usually the same pH meter can be used to measure soil solution pH and irrigation water pH. Chronic soil problems associated with either excessively low or excessively high pH can sometimes be corrected, but it is often easier to prevent them from developing.

Electrical Conductivity (EC–soil salts)

Related to pH is the level of salts in the soil solution. Because all the nutrients that the turf needs from the soil are available as salts in the soil solution, there is a direct connection between salt levels and fertility, but excessive salts can also cause problems with the turf (physiological drought, soil permeability problems, direct ion toxicity). Salt levels may fluctuate more during a season than pH because of fertilizer applications, but as with pH, the value of a regular record/history of salt levels is in anticipating problems or pinpointing solutions. Salt content is measured by the electrical conductivity of the soil solution (in deciSiemens per metre or dSm^{-1}). Typical salt-affected soils have soil salinity above 4 dSm^{-1}. As with pH, there are simple, robust EC meters available for field use (Figure 2) in roughly the same price range. Again, these meters can also be used to measure salt levels in irrigation water, if you are using a pond or greywater supply rather than potable water. Keep in mind that the EC readings will not differentiate among the various types of salts that may be present in the soil – that level of examination will require soil tests from a laboratory.

Soil Structure/Profile

Much information about your turf rootzone can be gleaned from a simple examination of the profile, which can be sampled using soil probes, cup cutters (for shallow depths), slab samplers, etc. (Figure 3). From the presence of thick, problem thatch to layers from improper topdressing, compaction, or black layer, many underlying causes of rootzone problems may be visible in the profile. There are some tools available to assess aspects of the rootzone profile from above. An example is a penetrometer (Figure 4), which can be used to determine the soil strength at various depths in a rootzone. If compacted layers are developing due to traffic or improper management, regular measurement of soil strength may detect this. Penetrometers vary in cost from ~$200 for simpler ones through ~$2,000 for one which records depths and soils strength electronically for download to a computer.

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Figure 4. Penetrometer.

Figure 5. TDR soil moisture meter (measures volumetric water content).

Figure 6. ThetaProbe soil moisture meter (measures volumetric water content).

Figure 7. Double ring infiltrometer

Soil Moisture

Soil moisture is a critical aspect of your rootzone that varies as much as hourly. Accurate assessment of soil moisture is the key to effective irrigation and important in assessing other aspects of rootzone health (drainage problems, etc.). Simple examination of the soil with a probe, particularly if done regularly, can be used to develop a history and feel for your rootzones.

There are also tools which can give you more precise types of information. Moisture meters can be relatively inexpensive ($100-200) ones based on simple technology (electrical conductivity), or more sensitive ones based on time-domain reflectometry (TDR, Figure 5) or frequency-domain reflectometry (ThetaProbe, Figure 6). The TDR probe and ThetaProbe will give sensitive measurements of the volumetric water content in the top 5-10 cm of rootzone, but are pricier ($1,500-$2000).

There are other tools that can be used to assess other aspects of soil moisture, for example a double ring infiltrometer (Figure 7, ~$300), which will measure the rate of infiltration of irrigation water into the rootzone, and may detect and quantify localized dry spots, hydrophobic thatch layers, compaction, or other drainage problems. ♦

— Pam Charbonneau, OMAFRA, Ken Carey and Erica Gunn, GTI

Thank-you to all who contributed to the success of this year's event!