Q&A

Making better decisions

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Questions?
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Q: One of our more common reasons to close a field is because it is too wet. Do you have any experience with the Lincoln Moisture Meter? I'm thinking it would be a good tool for me to use for making "field use" decisions and someone else could also use it if I am not on site at the time. What do you think?

Tommy Walston, East Carolina University

A: Sports turf managers are often innovators . . . and Tommy is one that is always thinking of ways to do things better . . . and asking the hard-to-answer questions! First, let talk about soil moisture meters. I have spent the past 10 years doing irrigation research so I have needed to use soil moisture meters on numerous occasions. But I have not specifically used the Lincoln Moisture Meter. That does not mean it would not be good for Tommy's proposed application.

Portable soil moisture devices that are commonly used in turf applications typically measure water content in the soil using a volumetric basis. Most of the meter types work based on the dielectric constant of the soil. Or in other terms, how easily an electrical charge can pass through the soil profile.

Soil is a composite material consisting of water, air, and minerals. Each of these affect the dielectric constant in the soil, but water in the soil is generally the most significant factor of influence. The best sensors use volumetric estimation via time domain reflectometry (TDR), time domain transmission (TDT), amplitude domain reflectometry (ADR), and frequency domain reflectometry (FDR). These technologies are usually stated in the descriptions for high-end soil moisture sensors.

I did a little searching around the internet looking for more information on the Lincoln Soil Moisture Meter. It is readily available for under $100, simple to use, requires only one AA battery, and is compact in size. According to the product information it can be adjusted to soil type. But I could not find any information related to what technology it uses. Since it has only one probe it is not using one of the high-end estimation technologies, but with a metallic probe it surely uses some type of conductivity resistance measurement. To quote from the ads, "the meter reads in a scale of 1 to 10, with 1 being completely dry and 10 indicating full saturation."

I have seen other soil moisture testers also use a scale rather than actual percentage soil moisture. Those devices that use scales tend to be lower cost, lower accuracy devices. The question then becomes do they work well enough? And I do not know the answer to that question.

As a researcher, I strive for accuracy in measurements. But accuracy is not always important, particularly when it comes at a high cost. For example, in a sand-based soil, the difference between dead and living turf may occur over a 5% soil moisture range. In a clay-based soil the difference in field capacity and permanent wilting could be over a 15% range. So, the heavier your soil, the more margin of error you have in evaluating soil moisture. Why spend $1,000 on an accurate soil moisture device if an $85 device is accurate enough?

Second, can the device be used to suggest a field closure due to excess moisture as Tommy proposed? Using a device that can repeatedly give an indication of soil moisture can be a very valuable management tool. Soil moisture meters are frequently used to help manage irrigation events. By finding a turf's lower soil moisture threshold (just before wilt), then one could easily monitor the soil moisture status and determine when to add additional water. If the device will allow it, then one could just as easily evaluate saturated soils that would be too wet for activities. The literature on the Lincoln device suggests that a 4 to 6 range on their scale is sufficient water for average plants, implying that anything over a 6 could be excess.

We know that playing on a wet field is more likely to cause damage to the turf and the soil surface. The field may also provide less surface traction to the athlete and therefore increase the risk of injury to the athlete. So, knowing that the soil is saturated with water could be very beneficial. And since the information is coming from a device, not from just one person's opinion, many people may not be as skeptical with the decision to close a field.

While a seasoned turf professional usually has no problem making that call, a less experienced assistant, student worker, referee, etc., may appreciate a device that can provide additional information, and in some respects re-enforce decisions. Some of the human judgment has been removed or at least deferred to the turf manager's soil moisture experience calibration with a soil moisture device.

So, the work will be on turf manager to field test the device over soil moisture conditions to get comfortable with correlating the values on the device's scale to saturated soil conditions. It also may be helpful to test the accuracy of one of these simpler devices with a more sophisticated model. That may provide assurance to the field manager that the device is reliable and has suitable accuracy to evaluate a field. ■