All Things *Considered*

Trust But Verify

Don´t just assume — test putting green drainage characteristics.

BY TODD LOWE

Rootzone mix depth variability can be determined by inserting a metal rod through the soil to the gravel layer.

The USGA Guidelines for a Method of Putting Green Construction ("USGA Guidelines") were created in 1960 to provide healthy putting greens with good soil physical properties. They were developed following years of research by Dr. Marvin Ferguson and other notable soil scientists, and they have been revised on several occasions since that time. USGA Guidelines provide the most reliable form of putting green construction, offering consistent drainage and compaction resistance. Quality control measures can be implemented during the original construction or renovation, and there are several helpful resources on the USGA Green Section website to assist courses with this endeavor. However, following construction soil saturation problems can arise that may or may not have anything to do with the construction process. There are several techniques, tools, and analytical services that can be used to help determine the causes of various problems.

When it comes to soil saturation, it is important not to overlook basic factors like irrigation coverage or organic matter accumulation. Organic matter in the upper rootzone increases a soil's water-holding capacity, and rootzones with excessive organic matter exhibit decreased drainage. Each factor should be examined, even tested, before other considerations are viewed. Catch-can analyses can determine irrigation efficiency, and accredited soil labs can test organic matter concentration and perform undisturbed core analyses to test soil physical properties.

Many USGA greens function properly and seldom exhibit drainage problems. Even so, drainage cleanouts and outfalls become overgrown and their locations unknown over time. Also, rootzone depths are generally not determined when putting greens drain consistently. Yet, these factors

often are brought into question when wet or dry spots occur on greens.

Locating the drainage cleanout and performing a flush with a chemical tracker dye is a good practice to perform on all USGA greens, especially if drainage issues are suspected. Locating these features might be difficult without a good set of as-built plans, but it is important to know where they exist on each putting green. Flushing the drain lines cannot detect lateral line problems but is instrumental in locating drainage outfalls and determining problems like tree root intrusion. Other tools like sewer viewer cameras and ground penetrating radar can pinpoint potential problems, as well.

Wet conditions can occur on downfall areas of greens, where water flows off the green through surface drainage. Wicking barriers and/or high collars can cause additional water to be retained along the putting green perimeters and create periods of prolonged soil saturation. Black layer is common in these areas, as anaerobic conditions persist. It is important to make sure that perimeter drainage is present and functioning properly, but some courses also remove sections of the wicking barrier and smooth the tie-in along the green's edge to improve surface runoff.

Another factor that is sometimes questioned by golf course superintendents is rootzone depth consistency. The USGA recommends that 12 inches of rootzone mix (±1 inch) be installed atop a four-inch (minimum) gravel layer. Rootzone depth can increase slightly over time, due to organic matter accumulation and topdressing activities, but it should be consistent throughout the entire putting green.

Variable mixes can cause drier conditions in areas with additional mix and wetter conditions in shallower areas. If a variable mix is suspected to cause putting green performance issues, it should be tested by inserting an implement, like a steel rod, down through the soil until it hits the gravel layer. It can be marked incrementally to allow easy measurement of the mix, as one person makes the measurement and another person records the information. The entire green should be measured using a grid pattern of a certain distance, like 5 feet by 5 feet. As a comparison, it is important to measure rootzone depths of questionable greens as well as greens with no drainage concerns. Healthy greens can be maintained on variable-mix depths, but it is important to understand where problematic areas may exist and to irrigate appropriately.

Undisturbed core analysis can determine important soil physical properties and whether soils drain adequately.

The tests mentioned in this article are not necessarily for problematic greens. Any golf course can perform catch-can analyses, test soil physical properties, and determine drainage features and rootzone depths. In fact, some courses perform some of these tests, like soil tests, on an annual basis. However, these important tests should be made before any major decisions are made concerning long-range improvements to the golf course.

TODD LOWE *is a senior agronomist in the Green Section's Florida Region.*