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Roots—A Key Plant Health Indicator

James B Beard

One can interpret more about past cultural practices and potential future turf problems by examining the underground turfgrass root characteristics and root environment than by any other approach. A root examination is much more comprehensive if a 4 inch (100 mm) diameter root core is removed, examined, and then carefully broken up in progressive sections starting from the bottom, with each section also examined. Be sure to note the coloration of the roots, with white being healthy and actively growing, light-brown being functional, and thin/brown-to-black being very restricted to nonfunctional in terms of water and nutrient uptake. It behooves the turf manager to take the time to periodically

examine the root profile and trends in growth and dieback at regular intervals throughout the year. It is amazing how many consultants conduct site visitations without ever examining the underground rooting aspects.

To properly conduct a root examination, **it is important to know the rooting characteristics of each turfgrass species involved, as well as how these root system characteristics vary seasonally throughout the year and finally how they are affected by various turfgrass cultural practices.** Thus, the following discussion will be oriented around these three crucial dimensions.

ROOT CHARACTERISTICS

The root systems of C₃ cool-season turfgrasses are characterized as fine, fibrous, and multibranching. Typically, the roots extend to depths no greater than 12 to 18 inches (300–450 mm), and under severe summer heat stress on closely mowed greens the roots may be less than 2 inches (50 mm) in depth. The closer the mowing height, the shorter the root system.

Rooting depth is a key dimension that is strongly affected by the cutting height and nitrogen nutritional level. **Higher mowing heights or moderate to low nitrogen levels have a positive effect on the root depth of C₃, cool-season turfgrasses.** The greater the rooting depth the greater the capability to take up moisture from a larger portion of the soil profile and thus the better the drought stress avoidance characteristics. The root density also is a significant characteristic which has a response pattern that is affected by environmental and soil factors similar to those of rooting depth.

TEMPERATURE EFFECTS

Seasonal variations in temperature have a strong effect on root growth, especially on the cool-season turfgrasses. **The soil temperatures for optimum root growth of most cool-season turfgrasses are in the range of 50 to 65°F (10–18°C).** Root growth gradually declines in terms of root initiation and growth extension rate as soil temperatures are increased or decreased from the optimum range. At soil

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